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MINERAL PROCESSING INVESTIGATIONS of BIRD RIVER CHROMITE ORE

as part of the

MANITOBA MINERAL DEVELOPMENT AGREEMENT

DSS Contract Serial No. OSQ85-00344
DSS File No. 14SQ.23440-5-9245

FINAL REPORT

MICROMEDIA

204pp

Project No. L.R. 3122

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ABSTRACT

A mineral processing investigation was performed on an ore sample from the Bird River deposit in Manitoba to recover chromite. In the laboratory phase, a flowsheet was developed which involved primary grinding, gravity separation, secondary grinding and gravity separation, followed by flotation of the gravity separation tailing. The gravity concentrates could be upgraded by magnetic separation. Similarly, the flotation concentrate could be cleaned by gravity and magnetic separation. Preconcentration by ore sorting, magnetic separation and heavy media separation was also examined.

The developed flowsheet was applied on a pilot plant scale in the second phase of the testwork to the ore directly and to ore preconcentrated by ore sorting and magnetic separation. Ore preconcentrated by heavy media separation was treated following the pilot plant flowsheet but on a laboratory scale. This type of preconcentration was shown to be the most effective.

The pilot plant results are summarized below. The chromite concentrate refers to that produced after the two stages of grinding and gravity separation.

Preconcentration	Accept Composite			Chromite Concentrate			
Method	Weight %	% Cr_2O_3	% Rec'y	O'all Wgt.%	% Cr_2O_3	% O'all Rec'y	Cr/Fe
None				18	30.2	77	0.78
Heavy Media Sep'n	50	11.7	90	14	30.0	67	0.84
Ore Sorting	55	11.0	85	15	30.5	64	0.90
Magnetic Sep'n	68	7.05	80	13	32.1	57	0.89

Treating the ore directly resulted in 77 % chromite recovery in a concentrate analysing 30 % Cr_2O_3.

The chromite concentrates produced in selected pilot plant tests conducted on the ore, were assayed for precious metals.

	Assays, g/t				
Product	Au	Pt	Pd	Rh	Ru
Coarse Table Concentrate	0.095	0.15	<0.05	0.017	0.19
Fine Table Concentrate	0.13	0.27	0.06	0.021	0.16
Flotation Concentrate	0.097	0.14	<0.05	0.029	0.27

ABSTRAIT

Une suite d'opération minérale pour la récuperation de chromite a été testé à partir de minerai provenant du depot "Bird River", Manitoba. Au course de la phase de laboratoire, une séquence a été developpée qui inclus un broyage primaire, une séparation par gravité, un broyage sécondaire et une séparation par gravité suivi par flotation du residue séparé par gravité. Les concentrés provenant des séparations par gravité pourraient être enrichis par séparation magnétique. De facon identique le concentré obtenu à partir de la flotation peut être nettoyé par gravite et séparation magnétique. Ont été aussi examiné des préconcentration obtenu par triage, séparation magnétique et séparation par liquer de densité.

Dans la deuxième phase de ce travail un "essai d'usine" à partir de la séquence développée précèdement a été effectué directement à partir de minerai et de minerai préconcentré par triage et séparation magnétique. Le minerai préconcentré par séparation par liquer de densité a été traité suivant la "séquence d'usine" mais à une échelle de laboratoire. "A"type de préconcentré a été le plus efficace.

Les resultats de "l'essai d'usine" sont résumés ci-dessous. Les resultats dans la colonne "concentré de chromite" se refère au produit obtenu après les deux étapes de triage et séparation par gravité.

Abstrait

Préconcentration Excepté Composite				Concentré de Chromite			
Méthode	Poids %	% Cr_2O_3	% de Récupération	% Total de Poids	% Cr_2O_3	% Total de Récupération	Cr/Fe
Pas de traitement				18	30.2	77	0.78
Séparation par Liquer de Densité	50	11.7	90	14	30.0	67	0.84
Triage de Minerai	55	11.0	85	15	30.5	64	0.90
Séparation Magnétique	68	7.05	80	13	32.1	57	0.89

Le traitement direct du minerai a abouti a l'extraction de 77 % de chromite dans un concentré contenant 30 % Cr_2O_3.

Le concentré de chromite obtenu dans le test No. PP-7A à partir du minerai a été analysé pour les métaux précieux avec les résultats suivants:

Produit	Essais, g/t				
	Au	Pt	Pd	Rh	Ru
Fractions Obtenues par					
Séparation par Gravité-Grossière	0.095	0.15	<0.05	0.017	0.19
-Fine	0.13	0.27	0.06	0.021	0.16
Concentré Obtenu par Flotation	0.097	0.14	<0.05	0.029	0.27

INTRODUCTION

This report contains the results of laboratory and pilot plant testwork conducted on a sample of the Bird River chromite ore as referred to in DSS File No. 14SQ23440-5-9245. In the first phase, a flowsheet was developed in the laboratory to recover chromite involving gravity separation, magnetic separation and flotation. Preconcentrating the ore by sorting, magnetic separation and heavy media separation was also investigated. Variations to the technical proposal were made in consultation with the Scientific Authority as the work proceeded.

In the second phase, the developed flowsheet was applied on a pilot plant scale to the ore directly and to ore preconcentrated by ore sorting and magnetic separation. Heavy media tests were performed using a Tri-Flo TFS 150 separator. The flowsheet was followed through on an accept composite on a laboratory scale.

The results were discussed with the Scientific Authority, Mr. P. Andrews, throughout the project.

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SUMMARY

1. Phase 1 - Flowsheet Development

1.1. Head Analysis

A representative sample of the ore was removed for analysis:

Chromium:	6.90 % Cr_2O_3
Total Iron:	9.44 % Fe (13.5 % Fe_2O_3)
Magnetic Iron:	3.36 % Mag Fe (4.64 % Fe_3O_4)
Magnesium:	22.9 % MgO
Alumina:	8.30 % Al_2O_3
Silica:	31.9 % SiO_2

In addition, a semi-quantitative spectrographic analysis was performed.

Qualitative Spectrographic Analysis

10 - 100 %	
3 - 30 %	Mg, Si, Fe
1 - 10 %	Cr, Al
0.3 - 3 %	
0.1 - 1 %	Na, Ca
0.03 - 0.3 %	
0.01 - 0.1 %	Mn, Zn, Ni, K
0.003 - 0.03 %	Sn, V, Ti, Co
0.001 - 0.01 %	Pb, Cu
0.0003 - 0.003 %	
0.0001 - 0.001 %	Ag
<0.0003 %	
I	
S	

I = Interference prevents positive identification
S = Strong spectral lines, unable to estimate amount

Unless specified above, the following were not detected at the approximate ppm lower limits of 0.5 Cu, Ag; 1 Mn; 5 Mg, Cr; 10 Be, Bi, Ca, Co, Ni, V; 25 Ge, Fe, Pb, Mo, Si, Sr, Sn, Ti, Zr, Tl, Pd, U, Th; 50 Al, Sb, B, Cd, Ga Li, Zn; 100 As, Au, Ba, In, Na; 200 Nb, Ta, W, Rb, Pt; 300 Te, Y, Ce

Summary - Continued

1.2. Mineralogy

A mineralogical examination was performed on a minus 10 mesh head sample. The opaque mineral assemblage consisted of coarse, rounded grains of chromite, erratic coarse to fine patches of magnetite and traces of millerite, violarite and chalcopyrite. The chromite is estimated to be 50 % plus 80 mesh and shows typical zoned textures. Pale gray iron-rich rims surround a darker, chrome-rich interior. Millerite, violarite and magnetite are part of the ultramafic host rock association.

Serpentine is the major gangue mineral. Other minor gangue constituents are chlorite, pyroxene, amphibole and quartz.

Additional mineralogical work was performed on a head sample screened at 20, 35, 65 and 100 mesh. Each size fraction was examined optically and point counts were taken of the chromite grains. Liberation of the chromite was evident only in the finer fractions as summarized below:

Size Fraction	% Cr_2O_3 Liberation
+20 Mesh	<5
+35 Mesh	<5
+65 Mesh	33
+100 Mesh	85
-100 Mesh	>95

In the plus 20 and 35 mesh fractions the chromite was present as middlings. The size of the chromite was 56 % +65 mesh in the plus 20 mesh and 62% +65 mesh in the plus 35 mesh fraction. The average chromite grain size was estimated to be 190 µm.

Summary - Continued

1.3. Preconcentration

Various methods of preconcentration of chromite were investigated.

1.3.1. Ore Sorting

Sorting tests were conducted on a sample of ore sized 150, 100 and 50 mm. Photometric sorting was not effective. Sorting tests were performed based on magnetic properties to produce accept and reject fractions. The results are summarized below.

TABLE NO. 1 - Ore Sorting Results

Product		Weight %	Assays %			% Distribution		
			Cr_2O_3	Fe	Mag Fe	Cr_2O_3	Fe	Mag Fe
-150 + 100 mm	Accept	16.2	13.4	10.8	1.95	31.4	18.4	9.5
	Reject	13.0	2.35	8.89	4.47	4.4	12.2	17.7
	Comb	29.2	8.46	9.95	3.08	35.8	30.6	27.2
-100 + 50 mm	Accept	20.9	10.4	10.1	2.44	31.5	22.3	15.5
	Reject	16.8	1.70	9.18	5.10	4.1	16.2	25.9
	Comb	37.7	6.52	9.72	3.62	35.6	38.5	41.4
-50 + 25 mm	Accept	9.6	10.4	9.91	2.19	14.5	10.0	6.4
	Reject	8.2	2.56	9.29	4.98	3.0	8.0	12.3
	Comb	17.8	6.78	9.63	3.48	17.5	18.0	18.7
-25 mm		15.3	5.03	8.00	2.74	11.1	12.9	12.7
Accept (Overall)		62.0	9.86	9.74	2.35	88.5	63.6	44.1
Reject (Overall)		38.0	2.11	9.10	4.86	11.5	36.4	55.9
Head (Calculated)		100.0	6.90	9.51	3.30	100.0	100.0	100.0

This method of preconcentration resulted in 89 % Cr_2O_3 recovery in 62 % of the weight. A more detailed summary of the sorting testwork has been reported by Ore Sorters (Canada) Limited in the appendix.

Summary - Continued

1.3.2. Magnetic Separation

Preconcentration by magnetic separation was investigated. The ore was fed to a Sala-Mortsell permanent drum magnetic separator at various drum speeds. The effect of particle size was briefly examined. The results are presented in Table No. 2 and Figure No. 1.

TABLE NO. 2

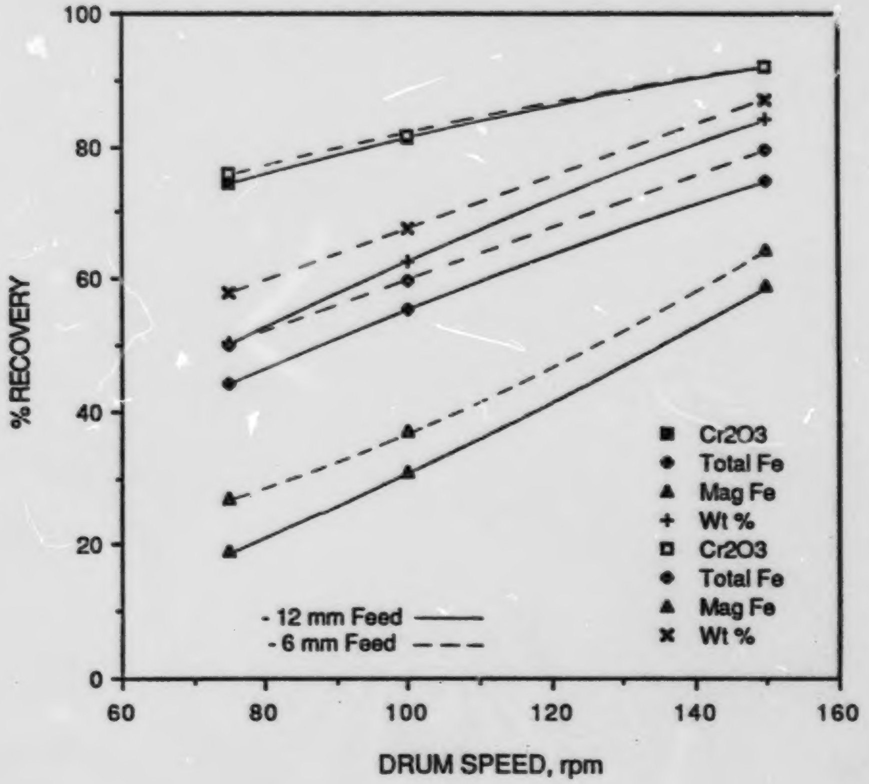
Magnetic Separation Results

Test No.	Feed Size	Product	Weight %	Assays, %			% Distribution		
				Cr_2O_3	Fe	Mag Fe	Cr_2O_3	Fe	Mag Fe
1	-12 mm	100 rpm Non-Mags Magnetics	62.7 37.3	8.69 3.33	7.85 10.6	1.70 6.42	81.4 18.6	55.3 44.7	30.8 69.2
		Head (Calc.)	100.0	6.69	8.89	3.46	100.0	100.0	100.0
6	-6mm	100 rpm Non-Mags Magnetics	67.8 32.2	7.24 3.43	8.25 11.7	1.99 7.08	81.7 18.3	59.8 40.2	37.2 62.8
		Head (Calc.)	100.0	6.02	9.36	3.63	100.0	100.0	100.0

The results were similar in the two tests. Approximately 35 % of the weight was rejected containing 18 % of the chromite under these conditions.

FIG. NO. 1

MAGNETIC SEPARATION



Summary - Continued

1.3.3. Heavy-Media Separation

Initial heavy liquid separation tests were conducted on ore crushed to minus 12 mm and sized at 6 and 35 mesh. Separations were performed covering a range of specific gravities from 2.7 to 3.3 in 0.1 intervals on the two coarser fractions. The results are summarized in Table No. 3 and shown graphically in Figure No. 2.

TABLE NO. 3 - Heavy Liquid Separation Results

Product		Weight %	Assays %			% Distribution		
			Cr_2O_3	Fe	Mag Fe	Cr_2O_3	Fe	Mag Fe
-12mm + 6 mesh	Sink	21.7	14.7	12.7	3.27	45.8	28.4	20.4
S.G. 2.9	Float	34.4	1.63	7.95	3.91	8.1	28.2	38.7
	Comb	56.1	6.67	9.79	3.67	53.9	56.6	59.1
-6 mesh + 35 mesh	Sink	13.0	13.0	12.8	4.05	24.4	17.1	15.1
S.G. 2.9	Float	18.4	1.28	6.72	2.98	3.3	12.8	15.7
	Comb	31.4	6.13	9.24	3.42	27.7	29.9	30.8
-35 mesh		12.5	10.2	10.5	2.82	18.4	13.5	10.1
Accept Comp		47.2	13.0	12.2	3.37	88.6	59.0	45.6
Reject Comp		52.8	1.51	7.52	3.59	11.4	41.0	54.4
Head (Calc)		100.0	6.94	9.70	3.48	100.0	100.0	100.0

The results of this testwork indicate that 89 % of the chromite could be recovered in 47 % of the weight by heavy media separation at a specific gravity of 2.9.

Summary - Continued

1.3.3. Heavy Media Separation - Cont'd

Heavy Liquid Separation

FIG. NO. 2A SPECIFIC GRAVITY vs RECOVERY

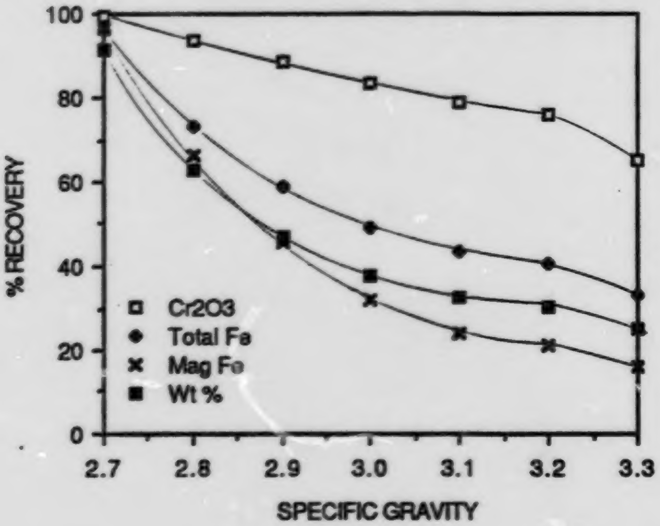
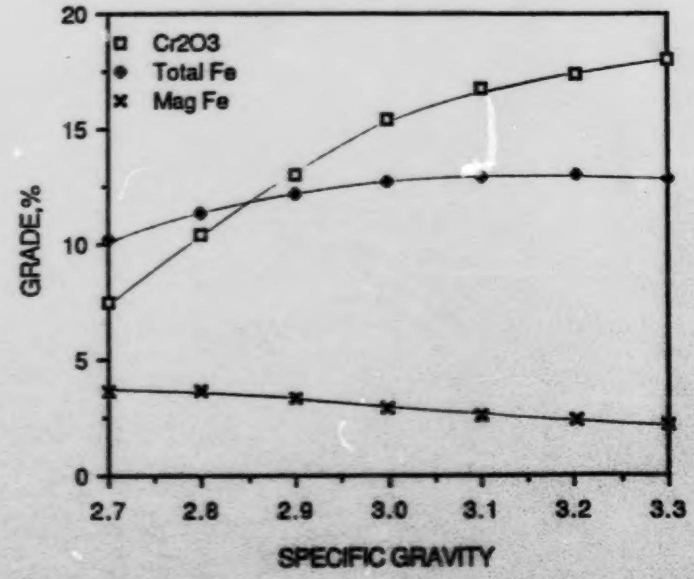


FIG. NO. 2B SPECIFIC GRAVITY vs GRADE



Summary - Continued

1.4. Dry Grinding and Separation

A test was performed to investigate the recovery of chromite by dry magnetic separation and electrostatic separation. A minus 20 mesh sample was screened at 65 mesh. The plus 65 mesh fraction was fed to a Carpco dry low intensity magnetic separator at 0.1 A. The non-mags were then passed through a Lurgi magnetic separator at 0.5 A. The Lurgi magnetic product was further upgraded by electrostatic separation. The results are presented in Table No. 4.

TABLE NO. 4

Dry Separation Results (Test No. 17)

Product	Weight	Assays, %			% Distribution		
	%	Cr_2O_3	Fe	Mag.Fe	Cr_2O_3	Fe	Mag.Fe
Non-Conductors	3.6	8.89	10.4	3.31	6.2	4.9	4.5
Lurgi Mags.	13.4	4.59	7.86	2.95	11.7	13.7	14.8
Carpco Non-Mags.	45.0	5.25	5.82	1.13	45.1	34.2	19.1
Carpco Mags.	13.1	8.08	16.0	8.62	20.2	27.3	42.4
Plus 65 mesh	58.1	5.89	8.11	2.82	65.3	61.5	61.6
Minus 65 mesh	41.9	4.35	7.04	2.44	34.7	38.5	38.4
Head (calculated)	100.0	5.24	7.66	2.66	100.0	100.0	100.0

Dry magnetic and electrostatic separation was not effective following this procedure. No further testwork was conducted using this method.

Summary - Continued

1.5. Wet Primary Separation

The recovery of a chromite concentrate by gravity separation was investigated. A sample of ore was stage ground to minus 20 mesh and screened at 65 mesh. Each size fraction was fed to a Wilfley table with recirculation of the middling fraction. The final -20 +65 mesh middling product was reground and retabled. Further cleaning of the gravity concentrate by magnetic separation was investigated using a Jeffrey wet drum magnetic separator. The flowsheet is shown in Figure No. 3 and the results are presented in Table No. 5.

TABLE NO. 5

Gravity Separation Results

Product		Weight %	Assays %			% Distribution		
			Cr_2O_3	Fe	Mag Fe	Cr_2O_3	Fe	Mag Fe
-20 + 65 mesh	Non-mags	2.4	37.1	23.8	2.01	12.4	6.0	1.4
	Table conc	2.7	35.4	25.8	4.64	13.8	7.6	3.6
	Comb conc*	4.8	35.4	25.4	4.69	24.2	13.1	6.5
	Midds + tail	50.8	4.77	8.27	3.32	34.3	45.0	48.3
-20 + 65 mesh (Calc.)		55.6	7.42	9.75	3.43	58.5	58.1	54.8
-65 mesh	Non-mags	1.0	36.8	24.9	2.56	5.0	2.6	0.7
	Table conc	1.4	31.8	31.9	11.6	6.5	4.9	4.8
	Midds + Tail	43.0	5.75	7.99	3.28	35.0	36.9	40.5
-65 mesh (Calc)		44.4	6.58	8.76	3.55	41.5	41.8	45.3
Combined Table concs**		6.2	34.5	26.9	6.27	30.6	18.1	11.2
Head (Calc)		100.0	7.05	9.31	3.49	100.0	100.0	100.0

* Includes the +65 mesh table concentrate and the table concentrate from the repassed reground +65 mesh table middling

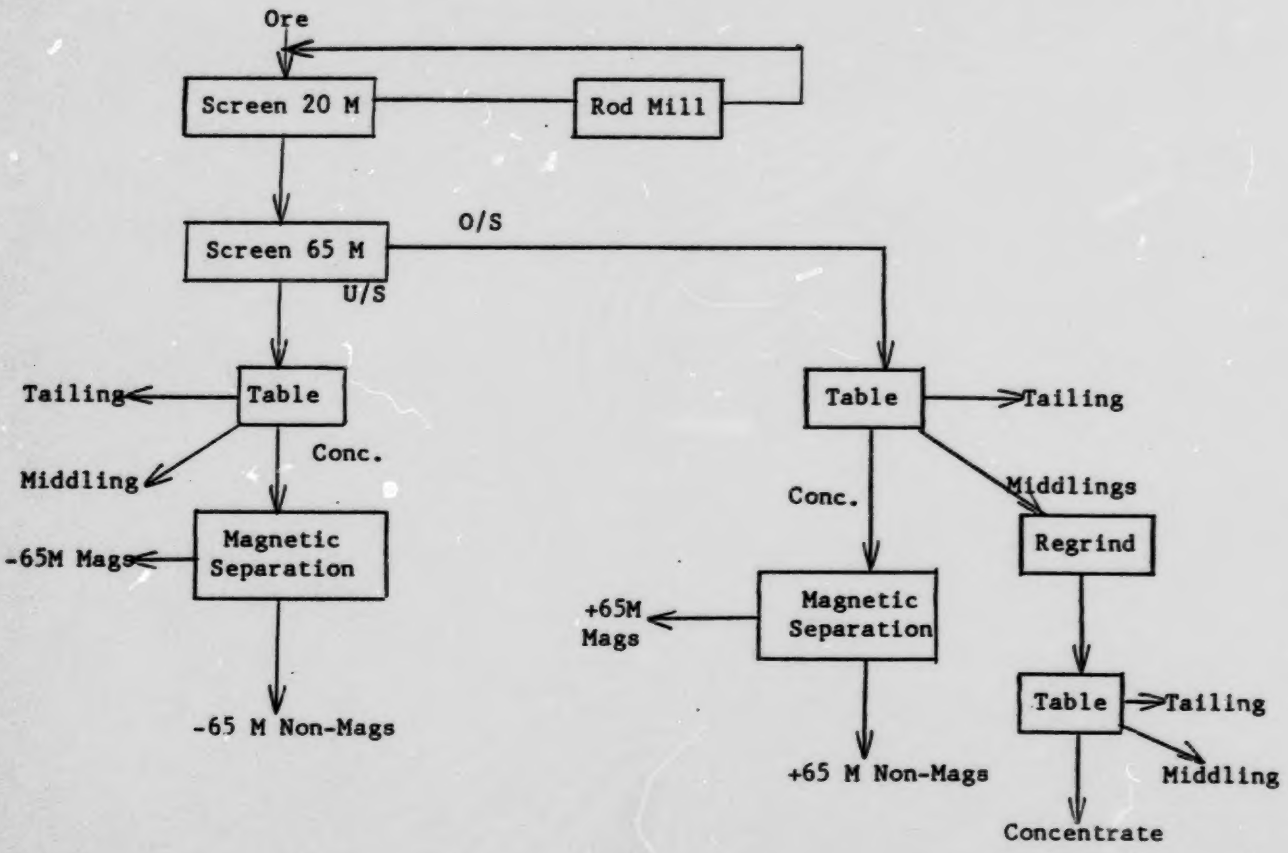
** Includes the +65 mesh comb concentrate and the -65 mesh table concentrate

The Cr/Fe ratios of the +65 mesh and -65 mesh table concentrates were 0.95 and 0.68 respectively. After magnetic separation, the Cr/Fe ratios of the chromite concentrates were 1.07 (+65 mesh) and 0.95 (-65 mesh).

Summary - Continued

1.5. Wet Primary Separation - Cont'd

Figure No. 3 - Gravity Separation Flowsheet (Tests 7-9)


Ore
Screen 20 M
Rod Mill
Screen 65 M
O/S
U/S
Table
Tailing
Middling
Conc.
Magnetic Separation
-65M Mags
-65 M Non-Mags
Table
Tailing
Conc.
Middlings
Regrind
Magnetic Separation
+65M Mags
+65 M Non-Mags
Table
Tailing
Middling
Concentrate

Summary - Continued

1.5. Wet Primary Separation - Cont'd

Tests were also conducted to investigate the production of a chromite concentrate by gravity separation from the accept and reject composites produced by each of the preconcentration methods. The procedure outlined in Figure No. 3 was applied.

TABLE NO. 6 - Gravity Separation Results

Test No.	Feed	Product		Weight %	Assays, %			% Distribution			Cr/Fe Ratio
					Cr_2O_3	Fe	Mag.Fe	Cr_2O_3	Fe	Mag.Fe	
10	Ore Sorters Accept Comp.	-20+65M	Non-Mags.	0.75	38.4	23.9	1.95	3.8	1.8	0.5	1.10
			Table Conc.	0.79	37.5	25.0	3.40	3.9	2.0	0.8	1.03
			Comb. Conc.	2.03	38.0	24.5	3.04	10.1	5.1	1.9	1.06
		-65 M	Non-Mags.	1.80	39.9	24.9	2.25	9.4	4.6	1.3	1.10
			Table Conc.	2.11	37.6	27.6	5.74	10.4	6.0	3.8	0.93
		Comb. Table Conc.		4.13	37.8	26.1	4.42	20.5	11.1	5.7	0.99
		Head (calculated)		62.0	10.9	9.98	2.26	88.5	63.6	44.1	-
12	Ore Sorters Reject Comp.	-20+65M	Non-Mags.	0.13	29.9	22.9	4.10	0.5	0.3	0.2	0.89
			Table Conc.	0.34	27.5	31.1	12.4	1.2	1.1	1.3	0.60
			Comb. Conc.	0.61	26.9	34.3	16.0	2.2	2.2	2.9	0.54
		-65M	Non-Mags.	0.18	30.8	30.3	8.81	0.7	0.6	0.5	0.70
			Table Conc.	0.36	23.3	41.3	23.9	1.1	1.6	2.6	0.39
		Comb. Table Concs.		0.97	25.6	36.9	18.9	3.3	3.8	5.5	0.47
		Head (calculated)		38.0	2.28	8.92	4.87	11.5	36.4	55.9	-
14	Mag. Sep'n Accept Comp.	-20+65M	Non-Mags.	0.86	39.3	23.7	1.63	5.0	2.1	0.4	1.13
			Table Conc.	0.93	38.8	24.1	2.14	5.3	2.3	0.6	1.10
			Comb. Conc.	1.87	39.2	23.9	2.03	10.8	4.7	1.1	1.12
		-65 M	Non-Mags.	0.70	40.2	23.8	1.98	4.2	1.8	0.4	1.16
			Table Conc.	0.88	38.5	25.6	4.02	5.0	2.4	1.3	1.03
		Comb. Table Concs.		2.75	38.9	24.5	2.67	15.8	7.1	2.1	1.09
		Head (calculated)		62.7	8.81	8.41	1.70	81.4	55.3	30.8	-
16	Mag. Sep'n Reject Comp.	-20+65M	Non-Mags.	0.47	27.7	22.8	4.67	1.9	1.1	0.6	0.83
			Table Conc.	0.76	25.7	27.5	9.83	2.9	2.3	2.2	0.64
			Comb. Conc.	1.22	26.2	31.5	13.7	4.6	4.1	4.8	0.57
		-65 M	Non-Mags.	0.26	33.4	26.0	3.97	1.3	0.7	0.3	0.88
			Table Conc.	0.77	25.7	37.2	18.7	2.9	3.0	4.2	0.47
		Comb. Table Concs.		1.99	26.0	33.7	15.6	7.5	7.1	9.0	0.53
		Head (calculated)		37.3	3.44	11.3	6.39	18.6	44.7	69.2	-
19	Heavy Liquid Sep'n Accept Comp.	-20+65M	Non-Mags.	1.93	37.7	23.6	1.61	10.6	4.6	0.9	1.09
			Table Conc.	2.04	36.8	24.5	2.78	11.0	5.0	1.6	1.03
			Comb. Conc.	4.07	37.1	26.0	3.92	22.1	10.6	4.4	0.99
		-65M	Non-Mags.	2.66	39.0	24.7	2.19	15.2	6.6	1.6	1.08
			Table Conc.	3.24	36.4	27.8	5.96	17.3	9.1	5.4	0.90
		Comb. Table Concs.		7.31	36.8	26.8	4.83	39.4	19.7	9.8	0.94
		Head (calculated)		47.2	12.8	12.4	3.47	88.6	59.0	45.6	-
18	Heavy Liquid Reject Comp.	-20+65M	Non-Mags.	0.29	24.0	25.0	7.40	0.9	0.7	0.5	0.66
			Table Conc.	0.36	22.3	27.2	10.3	1.1	1.0	1.0	0.56
			Comb. Conc.	0.80	22.6	30.7	13.5	2.4	2.4	2.8	0.50
		-65M	Non-Mags.	0.43	24.8	23.6	5.40	1.4	1.0	0.8	0.72
			Table Conc.	1.01	22.1	34.9	17.0	2.9	3.5	4.5	0.43
		Comb. Table Concs.		1.81	22.3	33.0	15.4	5.3	5.9	7.3	0.46
		Head (calculated)		32.8	1.66	7.86	3.96	11.4	41.0	54.4	-

Summary - Continued

1.5. Wet Primary Separation - Cont'd

The overall results are summarized below in order to compare the recovery of chromite by gravity separation on the ore directly to gravity separation following preconcentration.

TABLE NO. 7

Overall Gravity Separation Results

Feed (Comp.)	Weight %	Combined Gravity Concentrates						
		Assays, %			Cr/Fe Ratio	% Distribution		
		Cr_2O_3	Fe	Mag.Fe		Cr_2O_3	Fe	Mag.Fe
Ore	6.25	34.5	26.9	6.27	0.88	30.6	18.1	11.2
Ore Sort. Accept	4.13	37.8	26.1	4.42	0.99	20.5	11.1	5.7
Ore Sort. Reject	0.97	25.6	36.9	18.9	0.47	3.3	3.8	5.5
Combined	5.10	35.5	28.2	7.17	0.86	23.8	14.9	11.2
Mag. Sep'n Accept	2.75	38.9	24.5	2.67	1.09	15.8	7.1	2.1
Mag. Sep'n Reject	1.99	26.0	33.7	15.6	0.53	7.5	7.1	9.0
Combined	4.74	33.5	14.1	8.10	0.68	23.3	14.2	11.1
Heavy Liq. Accept	7.31	36.8	26.8	4.83	0.94	39.4	19.7	9.8
Heavy Liq. Reject	1.81	22.3	33.0	15.4	0.46	5.3	5.9	7.3
Combined	9.12	33.9	28.0	6.93	0.83	44.7	25.6	17.1

Summary - Continued

1.6. Secondary Separation

The table middlings and tailings from tests 7 to 9 were combined for secondary separation testwork. This combined product, which analysed 3.5 % Cr_2O_3, was reground to minus 100 mesh in most tests. Flotation tests were conducted with and without a secondary gravity separation stage.

In the secondary gravity separation circuit, 28 % of the chromite in the ore was recovered in a table concentrate at a grade of 34 % Cr_2O_3. After magnetic separation of this concentrate, the grade was increased to 41 % Cr_2O_3 at 26 % overall chromite recovery with a Cr/Fe ratio of 1.17.

Before starting the flotation testwork, a review of literature was performed. References 1 to 6 were found most useful. Various anionic and cationic reagent combinations were applied over a range of pH values in conjunction with different modifiers. The conditions and results are summarized in Tables 8 and 9. The flotation feed was deslimed except where noted.

Summary - Continued

1.6. Secondary Separation - Cont'd

TABLE NO. 8 - Flotation Conditions

Test No.	Modifiers, Depressants	Collectors	pH
11[1]	Na_2SiF_6, H_2SO_4	FA3, Aero 825	5
13	Na_2SiF_6	FA3, Aero 825	6.4
15	Na_2SiF_6, H_2SO_4	FA3, Aero 825	5.8
20[2]	Starch, $Al(SO_4)_3$	FA2	11.0
22[3]	Na_2SiF_6	FA3, Aero 825	5.5
23[3]	H_2SiF_6, NaOH	FA3, Fuel Oil	5.5
24A	NaOH, $Al_2(SO_4)_3$	Armeen L8D	11.0
24B	H_2SO_4	Armac C	2.3
25	H_2SiF_6, Na_4EDTA	FA3, 825, Fuel Oil	5.5
26	H_2SO_4	Armac C	2.3
27[2]	H_2SO_4	Armac C	2.3
28	H_2SiF_6	Armac C	2.3
30[1]	H_2SO_4	Armac C	2.3
31	H_2SiF_6, Oxalic Acid	Duomac T, Ethofat	4.5
34A[1]	HF, Na_2SiF_6	FA3, Na oleate	5.5
34C[1]	H_2SO_4, H_2SiF_6	Armac C	2.2
35A[1]	H_2SO_4, H_2SiF_6	Armac C	2.2
35B[1]	HF, Na_2SiF_6	FA3, Na oleate	5.5
36A[1]	H_2SO_4	Armac C	2.2
36B1	H_2SO_4	Armac C	4.0
37A[1]	H_2SO_4, Na_2SiF_6	Pamak C4, Na oleate	4.5

1. Secondary gravity sep'n prior to flotation
2. Flotation feed was not deslimed
3. Deionized water used in flotation

Collectors:
FA2, FA3 - fatty acids
Aero 825 - anionic petroleum sulphonate
Armeen L8D - aliphatic amine
Armac C - cocoamine acetate
Duomac T - diacetate salt
Ethofat - polyethoxylated fatty acid
Pamak C4 - fatty acid

Summary - Continued

1.6. Secondary Separation - Cont'd

TABLE NO. 9

Flotation Results (Based on the feed to flotation)

Test	Cleaner Concentrate				Rougher Concentrate				Ro. Tail.	
	Wgt.	Assays, %		% Cr_2O_3	Wgt.	Assays, %		% Cr_2O_3	Assays,%	
No.	%	Cr_2O_3	Fe	Recovery	%	Cr_2O_3	Fe	Recovery	Cr_2O_3	Fe
11	4.3	13.7	24.7	13.9	23.3	7.7	13.2	42.1	3.90	7.9
13					18.3	5.9	12.4	27.8	4.83	8.99
15					39.9	7.5	12.4	69.8	3.06	6.85
20					43.2	3.3	6.9	32.4	4.87	9.71
22					54.4	5.58	10.1	74.1	5.22	10.1
23	14.0	7.96	14.4	26.6	21.0	7.46	13.5	37.3	4.75	8.32
24A						1.82	7.20	2.3		
24B	19.2	12.4	15.0	56.2	33.5	8.97	12.5	70.9	1.83	6.44
25					9.3	4.92	9.5	11.3	5.24	9.56
26	16.8	17.2	18.0	67.9	26.4	12.4	15.2	77.0	1.06	5.77
27					32.6	4.18	7.71	32.1	4.27	8.71
28	6.8	13.9	11.7	21.6	9.2	14.3	13.5	30.4	4.25	9.12
30	4.8	26.5	24.0	55.9	13.6	15.5	17.0	94.0	0.89	5.21
31	33.0	9.07	13.1	66.3	53.0	6.84	10.6	80.2	2.18	5.71
34A*	4.7	29.1	28.1	29.6	6.2	24.0	24.6	32.3	3.30	7.40
34C*	35.0	10.9	13.5	80.9	65.0	6.95	10.5	96.0	0.53	4.97
35A	29.0	9.24	12.3	79.8	42.1	7.05	11.1	88.2	0.69	5.96
35B	13.4	5.80	12.3	25.6	27.8	3.81	10.0	34.8	2.75	7.21
36A	20.4	11.6	14.8	70.6	37.4	7.77	12.9	87.2	0.68	5.76
36B	26.1	6.71	10.9	54.6	51.9	4.50	9.45	72.8	1.81	7.31
37A	23.2	6.16	14.5	66.8	67.6	2.66	8.39	83.9	1.08	4.60

* The flotation feed was the table middling only

Summary - Continued

1.6. Secondary Separation - Cont'd

As a result of the flotation testwork, the following conclusions were made.

- The best results were achieved using a cationic collector, Armac C (a cocoamine acetate) at pH 2.3.

- Desliming was essential to selectivity and reduced reagent consumptions by almost half. Chromite loss in the slime fraction was in the range of 5-10 % overall.

- The low pH was required for selectivity and recovery. Maintaining a rougher pH of 4 and cleaning at pH 2.3 was investigated to reduce acid consumption, however, chromite recovery in the rougher was reduced from 87 % to 72 %.

- Sulphuric acid was an acceptable pH modifier. The use of fluorosilicic acid in combination with H_2SO_4 did not improve selectivity. Reagent consumptions were 200 g/t Armac C and 10 kg/t H_2SO_4 based on the feed to flotation.

- The flotation concentrate could be upgraded to 32 - 33 % Cr_2O_3 by gravity separation.

Summary - Continued

1.7. Recovery of Chromite From the Slime Fraction

A single gravity separation test was performed to investigate the recovery of chromite from the slime fraction. A sample of the minus 30 µm slimes was placed on a Mozley separator using the flat table. The results of the separation are shown below.

TABLE NO. 10

Gravity Separation of the Slime Fraction

Product	Weight %	Assays, %		% Distribution		
		Cr_2O_3	Fe	Cr_2O_3 Ind.	Cr_2O_3 O'all	Fe
Concentrate	6.5	6.61	11.2	21.9	2.2	12.8
Tailing	93.5	1.64	5.32	78.1	7.8	87.2
Head (Calc.)	100.0	1.96	5.70	100.0	10.0	100.0

Upgrading was limited by the size of the sample. The overall recovery of chromite was 2 % at a grade of 6.6 % Cr_2O_3. Further work is required to determine the chromite recovery at a satisfactory grade.

1.8. Bond Work Index

The Bond Work Index of the ore was determined in a standard Bond ball mill closed circuit grindability test. The results are summarized below:

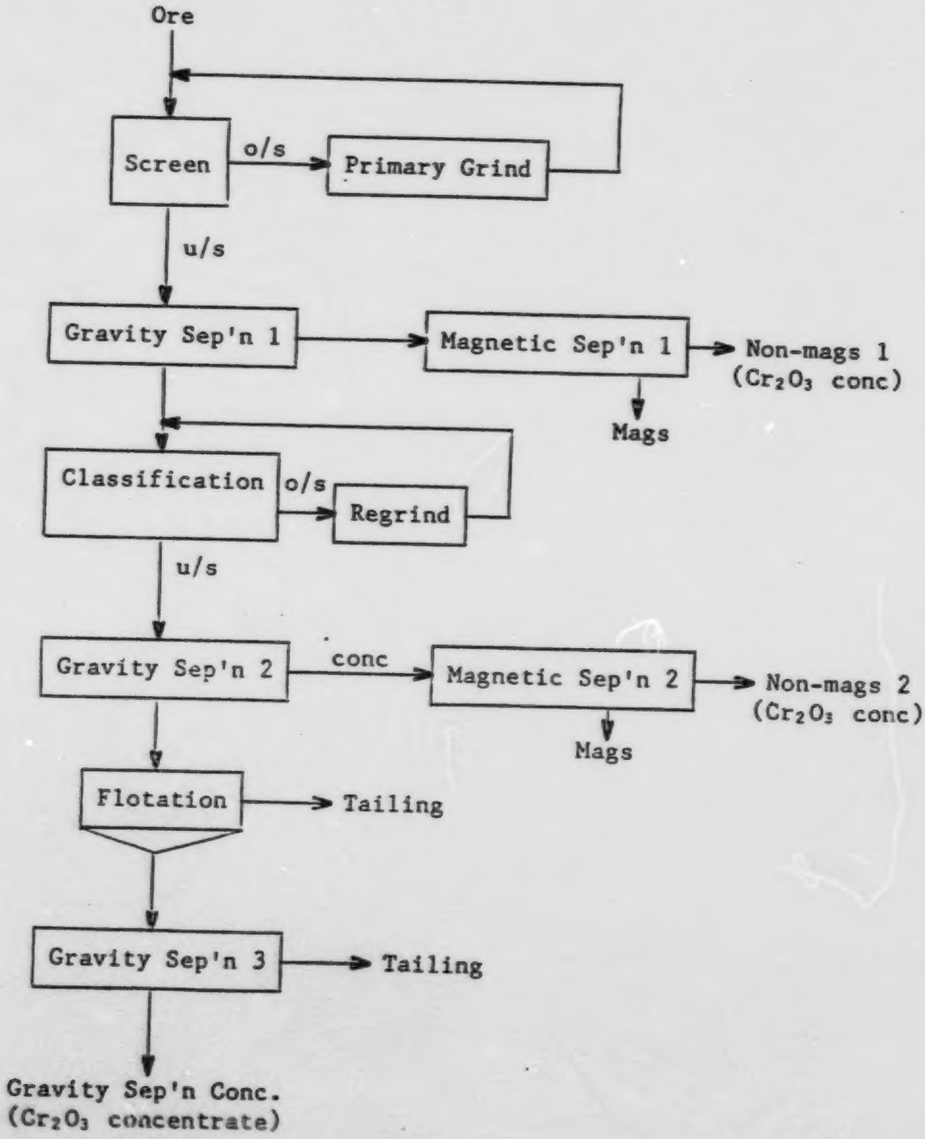
Bond Work Index:	20.8
Screen size, µm:	147
Net undersize produced per revolution, g:	0.90
Product K_{80}, µm:	109
Feed K_{80}, µm:	2149

Summary - Continued

1.9. Overall Results

As a result of the bench scale test program, the following flowsheet was developed for pilot plant investigation.

Figure No. 4 - Proposed Flowsheet


Ore
Screen
o/s
Primary Grind
u/s
Gravity Sep'n 1
Magnetic Sep'n 1
Non-mags 1
(Cr₂O₃ conc)
Mags
Classification
o/s
Regrind
u/s
Gravity Sep'n 2
conc
Magnetic Sep'n 2
Non-mags 2
(Cr₂O₃ conc)
Mags
Flotation
Tailing
Gravity Sep'n 3
Tailing
Gravity Sep'n Conc.
(Cr₂O₃ concentrate)

Summary - Continued

1.9. Overall Results - Cont'd

The chromite concentrates obtained by applying this flowsheet to the ore directly with a cationic flotation circuit (Armac C, pH 2.2) have been described in Table No. 11.

TABLE NO. 11

Chromite Concentrate

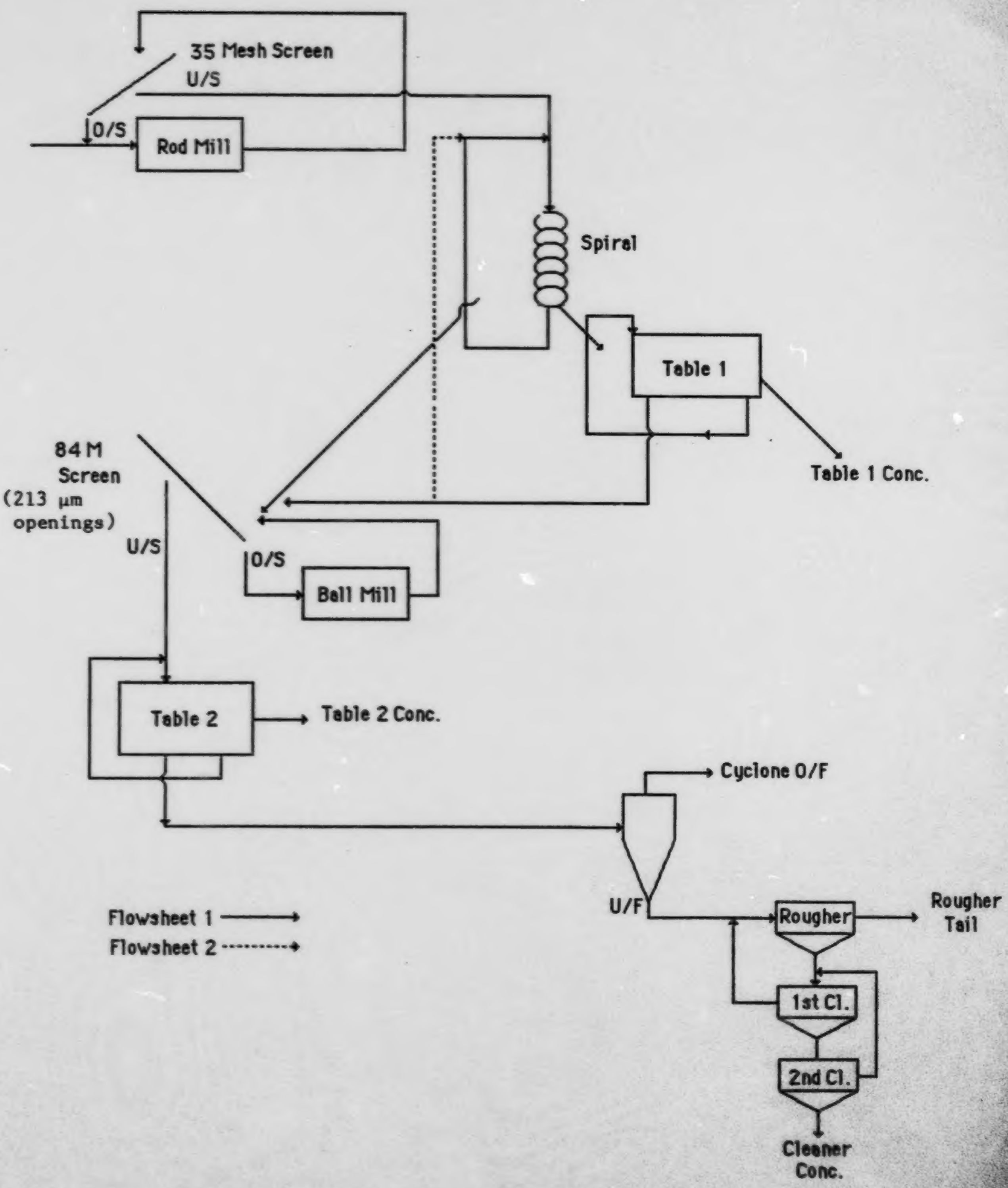
Product	Weight %	Assays, %		Cr/Fe Ratio	% Recovery	
		Cr_2O_3	Fe		Cr_2O_3	Fe
Non-mags 1	5.4	36.4	24.6	1.01	28	14
Non-mags 2	4.1	41.0	25.3	1.11	26	11
Gravity Sep'n Conc.	2.3	35.9	26.0	0.94	13	6
Combined Conc.	11.8	37.9	25.1	1.03	67	31

Summary - Continued

2. Phase 2 - Pilot Plant Testwork

The flowsheet developed in the laboratory was applied on a pilot plant scale to the ore directly and to ore preconcentrated by ore sorting and magnetic separation. The primary and secondary gravity separation concentrates and the flotation concentrate were collected during the pilot plant runs and later upgraded on a laboratory scale. The primary gravity separation was performed using a spiral and table with the table and spiral tailings being combined and fed to the regrind circuit. A modification to this circuit was examined by recirculating the table tailing to the spiral. The flotation was carried out at pH 2.5, maintained with sulphuric acid and Armac C as collector.

Figure No. 5 - Pilot Plant Flowsheet


35 Mesh Screen
U/S
O/S
Rod Mill
Spiral
Table 1
Table 1 Conc.
84 M
Screen
(213 µm
openings)
U/S
O/S
Ball Mill
Table 2
Table 2 Conc.
Cyclone O/F
U/F
Rougher
Rougher
Tail
1st Cl.
2nd Cl.
Cleaner
Conc.
Flowsheet 1
Flowsheet 2

Summary - Continued

2.1. Preconcentration

Samples of the ore were preconcentrated by ore sorting and magnetic separation to produce feed for the pilot plant. The ore sorting was performed on ore crushed to minus 100 mm and screened at 25 mm. The accept fraction and minus 25 mm material were combined for the pilot plant feed. The magnetic separation was performed on minus 6 mm crushed ore using a Sala Mortsell permanent drum magnetic separator. The results of these preconcentration methods are summarized in Table No. 12.

TABLE NO. 12 - Preconcentration Results

Pre-Concentration:Ore Sorting

Product	Weight	Assays, %			% Distribution			Ratio
	%	Cr_2O_3	Fe	Mag Fe	Cr_2O_3	Fe	Mag Fe	Cr:Fe
Accept	50.3	11.5	10.5	2.23	80.6	52.8	34.6	0.75
Fines	4.9	6.42	10.7	2.77	4.4	5.2	4.2	0.41
Reject	44.8	2.40	9.35	4.42	15.0	41.9	61.2	0.18
Head (Calc.)	100.0	7.17	10.0	3.24	100.0	100.0	100.0	0.49

Combined Products

Accept+Fines	55.2	11.0	10.5	2.28	85.0	58.1	38.8	0.72

Pre-Concentration:Magnetic Separation

Non-Magnetics	67.6	7.05	8.67	2.32	79.5	62.2	44.2	0.56
Magnetics	32.4	3.79	11.0	6.11	20.5	37.8	55.8	0.24
Head (Calc.)	100.0	5.99	9.42	3.55	100.0	100.0	100.0	0.44

Although both preconcentration methods are based on the magnetic properties of the minerals, the ore sorter method consistently gave better results than the permanent drum magnetic separator.

Summary - Continued

2.2. Pilot Plant Results

The results of the gravity separation circuits have been summarized in Table No. 14.

The recovery of chromite by gravity separation was higher than expected from the laboratory testwork. In test PP-7B, a chromite concentrate analysing 31 % Cr_2O_3 was achieved with 77 % chromite recovery. By pushing to higher grade concentrates, the recovery was significantly reduced. The results indicate that most of the chromite was recovered in the primary separation until the concentrate grade was increased above 33 % Cr_2O_3.

The chromite recovery was similar in the preconcentrated fractions based on the feed to the pilot plant circuit, however overall recoveries were approximately 12 % lower after gravity separation. The Cr/Fe ratio of the preconcentrated products was higher at this stage of treatment.

The variation in the head assays of the magnetically preconcentrated feed was reflected in the chromite recovery figures.

The loss of chromite in the cyclone overflow before flotation ranged from 5 - 10 % in the pilot plant testwork. The flotation results are presented in Table No. 15.

Summary - Continued

2.2. Pilot Plant Results - Cont'd

TABLE NO. 14 - Gravity Separation Results

Test	Feed		Flow-	Table 1 Concentrate				Table 2 Concentrate				Comb. 1+2 Concs.				O'all
No.	Product	% Cr_2O_3	sheet	Wgt. %	% Cr_2O_3	% Rec'y	Cr/ Fe	Wgt. %	% Cr_2O_3	% Rec'y	Cr/ Fe	Wgt. %	% Cr_2O_3	% Rec'y	Cr/ Fe	Cr_2O_3 Rec'y*
PP5	Ore	6.05	1	4.2	37.3	25.8	0.85	5.4	37.2	30.1	0.88	9.6	37.3	55.9	0.87	55.9
PP6	Ore	6.24	1	15.5	29.1	72.5	0.76	1.7	18.3	4.3	0.55	17.2	26.5	76.4	0.74	76.5
PP7A	Ore	7.13	2	17.7	30.5	75.3	0.79	1.1	15.9	2.5	0.50	18.7	28.8	77.8	0.78	77.8
PP7B	Ore	7.49	2	16.3	32.7	71.2	0.79	1.9	21.7	5.6	0.56	18.2	31.6	76.8	0.78	76.8
PP8A	OS Accept	10.8	1	17.4	33.2	53.6	0.91	6.9	32.9	21.2	0.90	25.4	33.1	74.8	0.91	63.6
PP8B	OS Accept	11.1	2	29.9	27.9	75.1	0.88	0.3	26.2	0.8	0.84	30.2	27.9	75.9	0.88	64.5
PP9B	MGS Accept	6.57	1	10.7	32.8	53.3	0.87	1.5	34.6	7.7	0.96	12.2	33.0	61.0	0.88	48.5
PP9A	MGS Accept	9.82	2	24.7	31.9	80.3	0.90	1.5	19.5	3.0	0.71	26.2	31.2	83.3	0.89	66.2

* based on ore

Summary - Continued

2.2. Pilot Plant Results - Cont'd

TABLE NO. 15 - Flotation Results

Test No.	PP Feed	Flotation Feed Assay % Cr_2O_3	Flotation Feed % Dist. Cr_2O_3	Flotation Concentrate Assay % Cr_2O_3	Flotation Concentrate % Cr_2O_3 Flot'n	Flotation Concentrate Rec'y O'all
6	Ore	2.1	18.7	6.3	20.9	3.9
7A	Ore	2.0	11.3	4.1	8.0	0.9
7B	Ore	2.4	17.8	7.8	17.4	3.1
8A	OS Accept	3.9	18.0	10.8	48.9	8.8
8B	OS Accept	4.1	16.1	13.2	41.6	6.7
9B	MGS Accept	3.2	31.7	8.5	36.9	11.7
9A	MGS Accept	2.3	12.2	8.3	9.0	1.1

As a result of better efficiency in the gravity separation circuits, the amount of chromite reaching the flotation circuit was decreased. In the case of the ore and magnetic separation accept composite, this also meant a lower grade feed to flotation than in the laboratory work.

The chromite concentrates produced in selected pilot plant tests conducted on the ore, were assayed for precious metals.

TABLE NO. 16 - Precious Metal Assays

Test No.	Product	Assays, g/t Pt	Ru	Au	Pd	Rh
PP-7A	Table 1 Conc.	0.15	0.19	0.095	<0.05	0.017
	Table 2 Conc.	0.27	0.16	0.13	0.06	0.021
	Flotation Conc.	0.14	0.27	0.097	<0.05	0.029
PP-7B	Table 1 Conc.	0.15	0.19	-	-	-
	Table 2 Conc.	0.23	0.17	-	-	-
	Flotation Conc.	0.18	0.25	-	-	-

Summary - Continued

2.3. Upgrading Pilot Plant Concentrates

The two table concentrates and the flotation concentrate produced in Test PP-7 (comb) were cleaned on a laboratory scale. The procedures and results are outlined below.

Test No.	Product	Treatment
PP7-1	Table 1 Concentrate	Magnetic Separation
PP7-2	Table 1 Concentrate	Regrind, magnetic separation
PP7-3	Table 1 Concentrate	Screen at 65 and 100 M, table each size fraction followed by magnetic separation of the table concentrates
PP7-5	Table 2 Concentrate	Table followed by magnetic separation
PP7-4	Flotation Concentrate	Table followed by magnetic separation

Summary - Continued

2.3. Upgrading Pilot Plant Concentrates - Cont'd

TABLE NO. 17 - Concentrate Upgrading

Feed	Product	O'all Wt. %	Assays,%		Ratio Cr/Fe	% Distr.(Ind)		% O/A Rec. Cr_2O_3
			Cr_2O_3	Fe		Cr_2O_3	Fe	
Table 1 Conc.	2.0A Non-Mags	9.2	36.3	21.2	1.17	61.7	41.8	45.2
	Mags	7.8	26.3	34.5		38.3	58.2	28.1
Table 1 Conc.	2.0A Non-Mags	12.5	34.9	21.8	1.10	80.5	58.1	59.0
	1.0A Non-Mags	13.8	34.4	22.6	1.04	88.0	66.8	64.5
	Mags	3.2	18.4	46.1		12.0	33.2	8.8
Table 1 Conc.	+65M Non-Mags	2.4	37.0	22.2	1.14	16.2	11.4	11.9
	+65M Table Conc.	3.7	33.4	26.2	0.87	22.8	20.9	16.7
	+65 M O'all*	6.1	33.5	26.5		37.2	34.5	27.3
	+100M Non-Mags	1.4	38.4	22.5	1.17	10.1	6.9	7.4
	+100M Table Conc.	2.0	35.1	26.3	0.91	13.2	11.6	9.7
	+100M O'all*	2.5	35.4	26.4		16.4	14.3	12.0
	-100M O'all	8.4	29.8	28.1	0.73	46.4	51.2	34.0
Table 2 Conc.	2.0A Non-Mags	0.5	28.4	17.6	1.10	50.9	26.3	4.1
	1.0A Non-Mags	0.5	28.1	18.0	1.07	52.0	27.7	4.2
	Table Conc.	0.9	22.9	25.6	0.61	73.3	68.3	5.9
	Table Midd+Tail.	0.6	14.2	20.2		26.7	31.7	2.2
Flot. Conc.	2.0A Non-Mags	0.1	12.7	8.33	1.04	21.5	10.5	0.6
	1.0A Non-Mags	0.1	12.7	8.95	0.97	21.9	11.5	0.6
	Table Conc.	0.1	12.5	11.2	0.76	23.6	15.7	0.7
	Table Midds+Tail.	0.2	2.59	3.83		76.4	84.3	2.3

* includes table conc and table tail

Regrinding the coarse table concentrate, Table 1 concentrate, increased the overall chromite recovery from 45 % to 65 % at 34.4 % Cr_2O_3.

Summary - Continued

2.4. Heavy Media Separation

Preconcentration by dense medium separation was investigated using a Tri-Flo TFS 150 pilot plant separator. The feed was ore crushed to minus 6 mm and screened at 30 mesh. The minus 30 mesh fraction was weighed and assayed. Batch separation tests were performed on the minus 6 mm +30 mesh material. The conditions and results are summarized in Table No. 18.

TABLE NO. 18

Heavy Media Separation Results

Test No.	Media S.G. Feed	Product	Weight %	Assays, %			Cr/Fe	% Distribution		
				Cr_2O_3	Fe	Mag Fe		Cr_2O_3	Fe	Mag Fe
TF1	3020	Sink	30.0	19.0	17.1	5.58	0.76	68.3	45.2	37.5
		Float	54.7	1.84	8.21	4.31		12.1	39.7	52.9
		-30 Mesh	15.3	10.7	11.2	2.79		19.6	15.1	9.6
		Accept Comp.	45.3	16.2	15.1	4.63		87.9	60.3	47.1
		Head(Calc.)	100.0	8.33	11.3	4.46		100.0	100.0	100.0
TF5	2620	Sink	35.0	12.1	12.6	4.00	0.66	64.8	45.3	38.0
		Float	49.7	1.36	7.24	3.74		10.3	37.0	50.4
		-30 Mesh	15.3	10.7	11.2	2.79		24.9	17.7	11.6
		Accept Comp.	50.3	11.7	12.2	3.63		89.7	63.0	49.6
		Head(Calc.)	100.0	6.56	9.72	3.69		100.0	100.0	100.0
TF6	2570	Sink	50.1	8.87	11.3	4.21	0.54	68.9	58.6	57.7
		Float	34.6	1.07	6.62	3.24		5.7	23.7	30.6
		-30 Mesh	15.3	10.7	11.2	2.79		25.4	17.7	11.7
		Accept Comp.	65.4	9.31	11.3	3.88		94.3	76.3	69.4
		Head(Calc.)	100.0	6.45	9.68	3.66		100.0	100.0	100.0

The results of test TF5 were similar to the results of the laboratory heavy liquid separation testwork. An accept composite was prepared from TF5 products. It was upgraded in the laboratory in two gravity separation stages similar to the pilot plant flowsheet. The table concentrates were cleaned by magnetic separation. The results are presented in Table No. 19.

Summary - Continued

2.4. Heavy Media Separation - Cont'd

TABLE NO. 19

Gravity Separation of the Accept Composite

Product	O'all Wt.%	Assays, %		Cr/Fe	% Distribution		% Overall Cr_2O_3 Rec'y
		Cr_2O_3	Fe		Cr_2O_3	Fe	
-30 M 2A Non Mags	8.9	33.2	20.0	1.14	51.3	29.0	46.0
1A Non Mags	9.7	32.8	20.7	1.08	55.2	32.7	49.5
Table Conc.	11.9	30.2	24.0	0.86	62.9	47.0	56.4
-100M 2A Non Mags	1.9	33.0	20.9	1.08	10.7	6.4	9.6
1A Non Mags	2.0	32.4	21.6	1.03	11.1	7.0	9.9
Table Conc.	2.4	29.2	25.3	0.79	12.3	10.1	11.0
Comb. Table Concs.	14.4	30.0	24.3	0.84	75.2	57.1	67.4
Table Midds+Tail.	35.9	3.97	7.30		23.8	42.9	22.3
Head (Calc.)	50.3	11.4	12.1		100.0	100.0	89.7

The overall recovery of chromite in the combined table concentrates was 67 % at a grade of 30 % Cr_2O_3. The concentrate grade was increased to 33 % Cr_2O_3 by magnetic separation with an overall chromite recovery of 56 %.

Summary - Continued

2.5. Overall Results

The overall results of the pilot plant testwork have been tabulated below. The overall recovery in the chromite concentrate refers to the chromite recovery after two stages of gravity separation and takes into account the preconcentration results.

TABLE NO. 20

Overall Pilot Plant Results

Preconcentration	Accept Composite			Chromite Concentrate			
Method	Wgt.%	% Cr_2O_3	% Rec'y	O'all Wgt. %	% Cr_2O_3	% O'all Rec'y	Cr/Fe
None	-	-	-	18.4	30.2	77.3	0.78
Ore Sorting[1]	55.2	11.0	85.0	15.3	30.5	64.1	0.90
Magnetic Sep'n[2]	67.6	7.05	79.5	13.0	32.1	57.4	0.89
Heavy Media	50.3	11.7	89.7	14.4	30.0	67.4	0.84

1. Average of PP8A and PP8B
2. Average of PP9A and PP9B

Heavy media separation was the most effective method of preconcentration. It should be remembered that upgrading of this accept composite was performed on a laboratory scale which earlier results indicated was less effective than the pilot plant. The overall chromite recovery was 67 % at a grade of 30 % Cr_2O_3 as compared to 77 % chromite recovery when the ore was treated directly.

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3. RI 5377 Laboratory Concentration of Chromite Ores, Red Mountain District, Kenai Peninsula, Alaska
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4. RI 6448 Beneficiating Low-Grade Chromites from the Stillwater Complex, Montana
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SAMPLE PREPARATION

In May 1986, a railcar containing Bird River chromite ore was received at Lakefield Research.

As the railcar was unloaded, the sample was split into two similar parts. Initially, one half was stored. From the second half a 1.5 ton sample was removed. It was crushed to minus 150 mm and sized at 100, 50 and 25 mm. These fractions were used for ore sorting testwork. The remainder of the second half was crushed to minus 50 mm. Approximately 1 ton was further crushed to minus 12 mm. Various fractions were roll crushed to minus 6 or 10 mesh as required for testwork. A head sample was removed from minus 10 mesh ore.

Ore for the pilot plant was crushed to minus 6 mm. Preconcentration by magnetic separation was performed at this size. The 6 t ore sample preconcentrated by Ore Sorters (Canada) Limited was crushed to minus 100 mm and sized at 25 mm. A sample of the minus 6 mm material was screened at 30 mesh for heavy media separation.

DETAILS OF TESTS

TEST NO. M1

Purpose: To separate magnetic material from non-magnetic material using a Sala Mortzell dry magnetic separator.

Procedure: The sample was passed through a Sala Mortzell dry magnetic separator at 150 rpm. The non-magnetics were passed a second and third time at 100 rpm and 75 rpm. The mags and non-mags were assayed.

Feed: 50 kg -1/2 inch ore.

SAMPLE NO. : COMPOSITE
SIZE FRACTION : minus 1/2 inch

PRODUCT	WEIGHT		ASSAY %			% DISTRIBUTION		
	kg	%	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe
150 rpm Magnetics	7.78	15.8	3.28	14.1	9.00	7.6	25.1	41.1
100 rpm Magnetics	10.60	21.5	3.36	8.10	4.52	10.8	19.6	28.1
75 rpm Magnetics	6.13	12.5	3.77	7.86	3.33	7.0	11.0	12.0
75 rpm Non-Magnetics	24.72	50.2	9.91	7.85	1.30	74.4	44.3	18.9
Head (Calc.)	49.23	100.0	6.69	8.89	3.46	100.0	100.0	100.0
COMBINED PRODUCTS								
150 rpm Non-Magnetics		84.2	7.33	7.91	2.42	92.2	74.9	58.9
100 rpm Non-Magnetics		62.7	8.69	7.85	1.70	81.4	55.3	30.8
100 rpm Magnetics		37.3	3.33	10.6	6.42	18.6	44.7	69.2
75 rpm Magnetics		49.8	3.44	9.94	5.64	25.6	55.7	81.1

TEST NO. M2

Purpose: To separate magnetic material from non-magnetic material using a Lurgi dry magnetic separator.

Procedure: The sample was passed through a Lurgi dry magnetic separator at 1.0 amperes. The non-magnetics were passed a second and third time at .5 amperes and .2 amperes. The magnetics and non-magnetics were assayed for Cr_2O_3 and Fe.

Feed: 2 kg minus 10 mesh sample

Metallurgical Results

Product	Weight %	Assays %			% Distribution		
		Cr_2O_3	Fe	Mag Fe	Cr_2O_3	Fe	Mag Fe
1. 1.0 amps mags	24.8	9.74	7.25	0.44	40.7	22.6	3.2
2. 0.5 amps mags	11.9	6.24	6.63	1.04	12.5	9.9	3.6
3. 0.2 amps mags	43.4	4.19	7.12	6.32	30.7	38.8	80.3
4. 0.2 amps non-mags	19.9	4.78	11.5	2.22	16.1	28.7	12.9
Head (Calc.)	100.0	5.93	7.97	3.42	100.0	100.0	100.0

Calculated Grades and Recoveries

Products 1 and 2	36.7	8.61	7.05	0.63	53.2	32.5	6.8
Products 1 to 3	80.1	6.21	7.09	3.72	83.9	71.3	87.1

TEST NO. M3

Purpose: To conduct a dry magnetic separation on a minus 12.7 mm plus 0.8 mm feed sample.

Procedure: As for Test MS-1 the sample was hand fed to the Sala dry fixed magnetic separator.

The speed was set at minimum. The magnetics were repassed twice after a splitter position adjustment to produce more non-magnetics.

Feed: Minus 12.7 mm plus 0.8 mm ore sample.

SAMPLE NO. : COMPOSITE TEST NO.: M3
SIZE FRACTION : -1/2 inch +20 mesh

	WEIGHT		ASSAY %			% DISTRIBUTION		
PRODUCT	kg	%	Cr2O3	Fe	Mag Fe	Cr2O3	Fe	Mag Fe
1st Pass Non-Mags	19.60	36.9	6.46	6.23	0.77	48.0	29.5	10.9
2nd Pass Non-Mags	3.66	5.9	4.60	8.21	2.68	6.4	7.3	7.1
3rd Pass Non-Mags	3.30	6.2	3.48	8.54	3.51	4.4	6.8	8.3
3rd Pass Magnetics	10.56	19.9	3.05	12.2	7.00	12.2	31.1	53.2
Minus 20 mesh	16.00	30.1	4.78	6.54	1.78	29.0	25.3	20.5
Head (Calc.)	53.12	100.0	4.96	7.79	2.61	100.0	100.0	100.0
COMBINED PRODUCTS								
1st Pass Magnetics		33.0	3.45	10.68	5.44	23.0	45.2	68.6
2nd Pass Magnetics		26.1	3.15	11.33	6.17	16.6	37.9	61.6
2nd Pass Non-Mags		43.8	6.17	6.5	1.07	54.4	36.8	17.9
3rd Pass Non-Mags		50.0	5.83	6.79	1.37	58.8	43.6	26.3

TEST NO. MS4

Purpose: To conduct a dry magnetic separation on a minus 6.3 mm ore feed sample.

Procedure: As for Test MS3.

Feed: Minus 6.3 mm ore sample.

SAMPLE NO. : COMPOSITE TEST NO.: M4
SIZE FRACTION : -1/4 inch

	WEIGHT		ASSAY %			% DISTRIBUTION		
PRODUCT	kg	%	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe
1st Pass Non-Mags	29.58	59.7	5.9	5.83	0.72	67.8	43.3	16.0
2nd Pass Non-Mags	4.29	8.7	4.54	7.83	2.54	7.6	8.4	8.2
3rd Pass Non-Mags	3.72	7.5	3.48	8.38	3.45	5.0	7.8	9.7
3rd Pass Magnetics	11.94	24.1	4.23	13.5	7.35	19.6	40.5	66.1
Head (Calc.)	49.53	100.00	5.20	8.04	2.68	100.00	100.00	100.00
COMBINED PRODUCTS								
1st Pass Magnetics		40.3	4.16	11.33	5.59	32.2	56.7	84.0
2nd Pass Magnetics		31.6	4.05	12.28	6.42	24.6	48.3	75.8
2nd Pass Non-Mags		68.4	5.73	6.1	0.95	75.4	51.7	24.2
3rd Pass Non-Mags		75.9	5.51	6.31	1.20	80.4	59.5	33.9

TEST NO. M5

Purpose: To investigate the liberation of chromite minerals using heavy liquid separation.

Procedure: The sample was screened at 6 mesh and 35 mesh. The minus 35 mesh was weighed and assayed for Cr_2O_3 and Fe. Heavy liquid separations were conducted on the 1/2 inch + 6 mesh and -6 mesh +35 mesh at 2.7 to 3.3 specific gravities (0.1 intervals) using methylene iodide and tetrabromoethene. The fractions were weighed and assayed for Cr_2O_3 and Fe.

Feed: 10 kg -1/2 inch sample.

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SAMPLE NO. : COMPOSITE
SIZE FRACTION : minus 1/2 inch

	PRODUCT	WEIGHT g	WEIGHT % IND.	O'ALL	ASSAY % Cr203	Fe	Mag Fe	% DISTRIBUTION (Ind.) Cr203	Fe	Mag Fe	% DISTRIBUTION (Overall) Cr203	Fe	Mag Fe
-1/2"+6M	S.G.3.3 Sink	751.2	14.1	7.9	26.2	14.6	1.02	55.4	21.0	3.9	29.9	11.9	2.3
	S.G.3.2 Sink	343.3	6.4	3.6	15.4	13.8	3.02	14.9	9.1	5.3	8.0	5.1	3.1
	S.G.3.1 Sink	130.4	2.4	1.4	9.76	12.5	4.83	3.6	3.1	3.2	1.9	1.8	1.9
	S.G.3.0 Sink	261.9	4.9	2.8	7.15	11.0	4.34	5.3	5.5	6.5	2.8	3.1	3.8
	S.G.2.9 Sink	574.6	10.8	6.0	3.68	10.40	5.30	5.9	11.4	15.6	3.2	6.5	9.2
	S.G.2.8 Sink	1138.5	21.3	12.0	2.31	9.11	4.72	7.4	19.9	27.5	4.0	11.3	16.2
	S.G.2.7 Sink	1896.8	35.6	20.0	1.35	7.58	3.76	7.2	27.9	36.5	3.9	15.8	21.5
	S.G.2.7 Float	236.8	4.4	2.5	0.55	4.49	1.27	0.4	2.0	1.5	0.2	1.2	0.9
-1/2"+6M(COMB.)		5333.5	100.0	56.1	6.67	9.79	3.67	100.0	100.0	100.0	53.9	56.6	59.1
-6+35M	S.G.3.3 Sink	446.1	15.0	4.7	24.7	16.0	2.51	60.3	25.9	11.0	16.7	7.7	3.4
	S.G.3.2 Sink	159.5	5.3	1.7	12.5	13.5	4.63	10.9	7.8	7.2	3.0	2.3	2.2
	S.G.3.1 Sink	61.7	2.1	0.6	8.14	11.8	4.92	2.7	2.6	3.0	0.8	0.8	0.9
	S.G.3.0 Sink	246.0	8.2	2.6	5.90	11.2	5.42	7.9	10.0	13.1	2.2	3.0	4.0
	S.G.2.9 Sink	319.3	10.7	3.4	3.41	9.48	4.67	6.0	11.0	14.6	1.7	3.3	4.5
	S.G.2.8 Sink	328.9	11.0	3.5	2.30	8.67	4.40	4.1	10.3	14.2	1.1	3.1	4.4
	S.G.2.7 Sink	829.5	27.8	8.7	1.38	7.43	3.49	6.3	22.4	28.4	1.7	6.7	8.7
	S.G.2.7 Float	592.5	19.9	6.2	0.56	4.64	1.48	1.8	10.0	8.6	0.5	3.0	2.6
-6+35M(COMB.)		2983.5	100.0	31.4	6.13	9.24	3.42	100.0	100.0	100.0	27.7	29.9	30.8
-35 Mesh		1184.0		12.5	10.2	10.5	2.82				18.3	13.5	10.1
Head Calc.		9501.0		100.0	6.34	9.70	3.48				100.0	100.0	100.0
COMBINED FLOATS													
-1/2"+6M	S.G.2.7 Float		4.4	2.5	0.55	4.49	1.27	0.4	2.0	1.5	0.2	1.2	0.9
	S.G.2.8 Float		40.0	22.5	1.26	7.33	3.48	7.6	29.9	38.0	4.1	17.0	22.5
	S.G.2.9 Float		61.3	34.4	1.63	7.95	3.91	15.0	49.8	65.5	8.1	28.2	38.7
	S.G.3.0 Float		72.1	40.5	1.93	8.31	4.12	20.9	61.3	81.1	11.3	34.7	47.9
	S.G.3.1 Float		77.0	43.2	2.27	8.48	4.17	26.2	66.8	87.6	14.1	37.8	51.7
	S.G.3.2 Float		79.5	44.6	2.50	8.61	4.19	29.8	69.9	90.8	16.1	39.6	53.6
	S.G.3.3 Float		85.9	48.2	3.46	9.00	4.10	44.6	79.0	96.1	24.1	44.7	56.8
-6+35M	S.G.2.7 Float		19.9	6.2	0.56	4.64	1.48	1.8	10.0	8.6	0.5	3.0	2.6
	S.G.2.8 Float		47.7	15.0	1.04	6.27	2.65	8.1	32.3	37.0	2.2	9.7	11.4
	S.G.2.9 Float		58.7	18.4	1.28	6.72	2.98	12.2	42.7	51.1	3.4	12.8	15.8
	S.G.3.0 Float		69.4	21.8	1.60	7.14	3.24	18.2	53.7	65.8	5.0	16.0	20.3
	S.G.3.1 Float		77.6	24.4	2.06	7.58	3.47	26.1	63.7	78.8	7.2	19.0	24.3
	S.G.3.2 Float		79.7	25.0	2.22	7.69	3.51	29.8	66.3	81.5	8.0	19.8	25.2
	S.G.3.3 Float		85.0	26.7	2.56	8.05	3.58	39.7	74.1	89.0	11.0	22.2	27.5
COMBINED SINKS													
-1/2"+6M	S.G.3.3 Sink		14.1	7.9	26.2	14.6	1.02	55.4	21.0	3.9	29.9	11.9	2.3
	S.G.3.2 Sink		20.5	11.5	22.8	14.3	1.65	70.2	30.1	9.2	37.9	17.0	5.4
	S.G.3.1 Sink		23.0	12.9	21.4	14.2	1.99	73.8	33.2	12.4	39.8	18.8	7.4
	S.G.3.0 Sink		27.9	15.6	18.9	13.6	2.49	79.1	38.7	18.9	42.7	21.9	11.2
	S.G.2.9 Sink		38.7	21.7	14.7	12.7	3.27	85.0	50.2	34.5	45.9	28.4	20.4
	S.G.2.8 Sink		60.0	33.7	10.27	11.4	3.79	92.4	70.1	62.0	49.9	39.7	35.6
	S.G.2.7 Sink		95.6	53.6	6.95	10.03	3.78	99.6	98.0	98.5	53.7	55.5	55.2
-6+35M	S.G.3.3 Sink		15.0	4.7	24.7	16.0	2.51	60.3	25.9	11.0	16.7	7.7	3.4
	S.G.3.2 Sink		20.3	6.4	21.5	15.3	3.07	71.2	33.7	18.2	19.7	10.1	5.6
	S.G.3.1 Sink		22.4	7.0	20.3	15.0	3.24	73.9	36.3	21.2	20.5	10.9	6.5
	S.G.3.0 Sink		30.6	9.6	16.4	14.0	3.83	81.5	46.3	34.2	22.7	13.9	10.6
	S.G.2.9 Sink		41.3	13.0	13.0	12.8	4.05	87.8	57.3	48.9	24.4	17.1	15.1
	S.G.2.8 Sink		52.3	16.4	10.77	11.9	4.12	91.9	67.7	63.0	25.5	20.2	19.4
	S.G.2.7 Sink		80.1	25.2	7.51	10.38	3.90	98.2	90.0	91.4	27.2	26.9	28.2

SAMPLE NO. : COMPOSITE
SIZE FRACTION : minus 1/2 inch

	PRODUCT	WEIGHT	WEIGHT %		ASSAY %			% DISTRIBUTION (Ind.)			% DISTRIBUTION (Overall)		
		g	IND.	O'ALL	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe
COMBINED PRODUCTS													
-1/2"+35M	S.G.3.3 Sink		14.4	12.6	25.6	15.1	1.58	57.0	22.7	5.7	46.6	19.6	5.7
	S.G.3.2 Sink		20.5	17.9	22.3	14.7	2.15	70.5	31.3	11.1	57.6	27.1	11.1
	S.G.3.1 Sink		22.8	19.9	21.0	14.5	2.43	73.8	34.3	13.9	60.3	29.7	13.9
	S.G.3.0 Sink		28.9	25.3	17.9	13.7	3.00	80.0	41.4	21.7	65.4	35.8	21.7
	S.G.2.9 Sink		39.6	34.7	14.1	12.7	3.56	85.9	52.7	35.4	70.2	45.5	35.4
	S.G.2.8 Sink		57.3	50.1	10.43	11.6	3.90	92.2	69.2	56.1	75.4	59.9	56.1
	S.G.2.7 Sink		90.1	78.8	7.13	10.14	3.82	99.1	95.2	86.4	81.0	82.4	86.4
-1/2"+35M	S.G.2.7 Float		10.0	8.7	0.56	4.60	1.42	0.9	4.8	3.6	0.7	4.1	3.6
	S.G.2.8 Float		42.8	37.4	1.17	6.90	3.15	7.7	30.8	33.9	6.3	26.6	33.9
	S.G.2.9 Float		60.4	52.9	1.50	7.52	3.59	14.0	47.4	54.5	11.5	41.0	54.5
	S.G.3.0 Float		71.2	62.3	1.82	7.90	3.81	20.0	58.6	68.2	16.3	50.7	68.2
	S.G.3.1 Float		77.3	67.6	2.19	8.16	3.92	26.1	65.7	76.0	21.4	56.8	76.0
	S.G.3.2 Float		79.6	69.6	2.40	8.28	3.94	29.4	68.7	78.8	24.1	59.4	78.8
	S.G.3.3 Float		85.[illegible]	74.9	3.25	8.66	3.91	43.0	77.3	84.2	35.1	66.9	84.2
-1/2"+35M + -35M	S.G.3.3 Sink			25.1	18.0	12.8	2.19				64.9	33.1	15.8
	S.G.3.2 Sink			30.4	17.4	13.0	2.43				75.9	40.6	21.2
	S.G.3.1 Sink			32.4	16.5	12.9	2.58				78.6	43.2	24.0
	S.G.3.0 Sink			37.7	15.4	12.7	2.94				83.7	49.3	31.8
	S.G.2.9 Sink			47.1	13.0	12.2	3.37				88.5	59.0	45.5
	S.G.2.8 Sink			62.6	10.39	11.4	3.68				93.7	73.4	66.1
	S.G.2.7 Sink			91.3	7.55	10.19	3.68				99.3	95.9	96.4

TEST NO. M6

Purpose:	To separate magnetic ore from non-magnetic ore using a Sala Martzell dry magnetic separator.
Feed Preparation:	The ore was stage crushed to 1/4" using conventional jaw and cone crushers in the sample preparation plant.
Procedure:	The sample was passed through a Sala Martzell dry magnetic separator at 150 rpm. The non-magnetics were passed a second and third time at 100 rpm and 75 rpm. The magnetics and non-magnetics were assayed for Cr_2O_3, Mag Fe + Total Fe.

TEST NO. : M6

SAMPLE NO. : COMPOSITE
SIZE FRACTION : minus 1/4 inch

	WEIGHT		ASSAY %			% DISTRIBUTION		
PRODUCT	kg	%	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe
150 rpm Magnetics	6.35	12.9	3.62	14.8	10.00	7.8	20.4	35.7
100 rpm Magnetics	9.45	19.2	3.31	9.65	5.11	10.6	19.8	27.1
75 rpm Magnetics	4.92	10.0	3.51	9.09	3.78	5.8	9.7	10.4
75 rpm Non-Magnetics	28.41	57.8	7.89	8.10	1.68	75.8	50.0	25.8
Head (Calc.)	49.12	100.0	6.02	9.36	3.63	100.0	100.0	100.0
COMBINED PRODUCTS								
150 rpm Non-Magnetics		87.1	6.38	8.56	2.68	92.2	79.6	64.3
100 rpm Non-Magnetics		67.8	7.24	8.25	1.99	81.7	59.8	37.2
100 rpm Magnetics		32.2	3.43	11.7	7.08	18.3	40.2	62.8
75 rpm Magnetics		42.2	3.45	11.10	6.29	24.2	50.0	73.2

TESTS 7, 8 and 9

TEST NO. 7

Purpose: To produce a high grade Cr concentrate from a minus 65 mesh fraction by tabling followed by magnetic separation of the table concentrate.

Feed Preparation: 36 kg of minus 10 mesh ore composite sample was stage ground in a large rod mill to minus 20 mesh.
The ground product was screened on a 65 mesh screen to produce a -20 plus 65 mesh fraction and a minus 65 mesh fraction.

- The minus 65 mesh fraction feed for Test 7
- The minus 20 plus 65 mesh fraction feed for Test 8

Procedure: The minus 65 mesh ore was hand fed to a Wilfley shaking table.
The table middlings were recirculated to the feed during operation.
The table concentrate was further upgraded by passing through the Jeffrey wet drum magnetic separator.
The first pass was conducted at 1.0 amps with the 1 amp magnetics repassed at 0.5 amps.

TEST NO. 8

Purpose: To treat the minus 20 mesh plus 65 mesh fraction by tabling and magnetic separation.

Feed Preparation: As for Test 7.
The minus 20 plus 65 mesh fraction was treated.

Procedure: As for Test 7, however the table middlings were retreated, Test 9.

TEST NO. 9

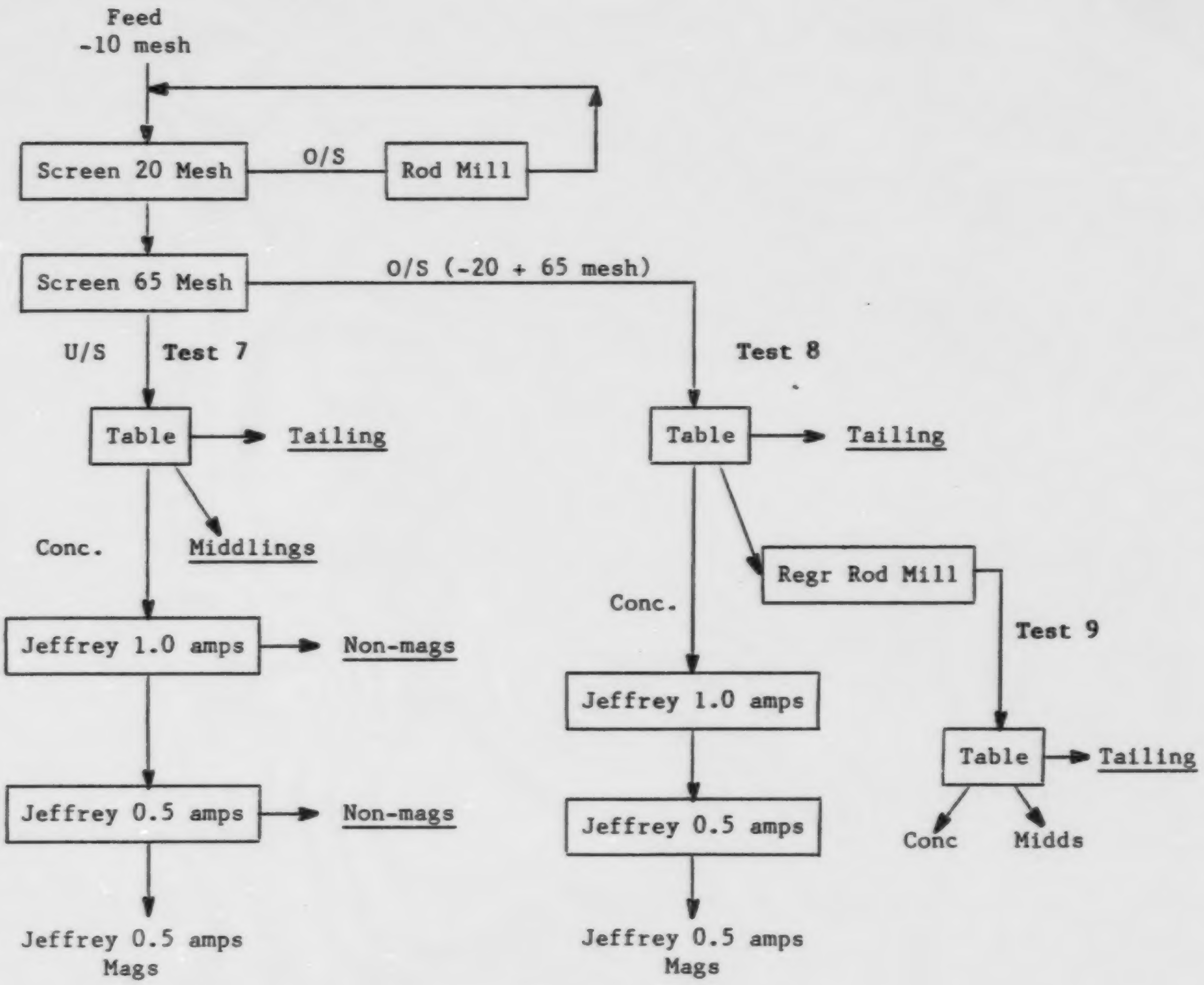
Purpose: To retable the table middling product of Test 8 (-20+65 mesh).

Procedure: The sample was reground and tabled following conditions of Test 8.

Grind: 15 minutes at 50 percent solids in the lab rod mill.

Feed: Table middling product Test 8.

FLOW DIAGRAM FOR TESTS 7, 8 and 9


Feed
-10 mesh
Screen 20 Mesh
O/S
Rod Mill
Screen 65 Mesh
O/S (-20 + 65 mesh)
U/S
Test 7
Table
Tailing
Conc.
Middlings
Jeffrey 1.0 amps
Non-mags
Jeffrey 0.5 amps
Non-mags
Jeffrey 0.5 amps
Mags
Test 8
Table
Tailing
Regr Rod Mill
Conc.
Test 9
Jeffrey 1.0 amps
Table
Tailing
Jeffrey 0.5 amps
Conc
Midds
Jeffrey 0.5 amps
Mags

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TEST NO : 7-9
SIZE FRACTION : minus 20 Mesh

PRODUCT	WEIGHT g	WEIGHT % IND.	WEIGHT % O'ALL	ASSAY % Cr203	ASSAY % Fe	ASSAY % Mag Fe	% DISTRIBUTION (Ind.) Cr203	% DISTRIBUTION (Ind.) Fe	% DISTRIBUTION (Ind.) Mag Fe	% DISTRIBUTION (Overall) Cr203	% DISTRIBUTION (Overall) Fe	% DISTRIBUTION (Overall) Mag Fe
-20+65 M 1.Non-Magnetics 1.0A	856.2	4.26	2.37	37.1	23.8	2.01	21.3	10.4	2.5	12.4	6.0	1.4
2.Non-Magnetics 0.5A	58.6	0.29	0.16	31.3	30.9	0.27	1.2	0.9	0.8	0.7	0.5	0.4
3.Magnetics	76.2	0.38	0.21	19.8	43.8	30.7	1.0	1.7	3.4	0.6	1.0	1.9
4.Retable Conc.	751.5	3.74	2.08	35.3	25.00	4.76	17.8	9.6	5.2	10.4	5.6	2.8
5.Retable Midds.	912.6	4.54	2.52	22.7	17.80	4.36	13.9	8.3	5.8	8.1	4.8	3.2
6.Retable Tail.	268.5	1.34	0.74	6.52	8.96	3.29	1.2	1.2	1.3	0.7	0.7	0.7
7.Table Tails.	17187.6	85.46	47.48	3.79	7.75	3.26	43.6	67.9	81.1	25.5	39.5	44.4
-20+65 M (calc.)	20111.2	100.00	55.55	7.42	9.75	3.43	100.0	100.0	100.0	58.5	58.2	54.7
-65 mesh 8.Non-Magnetics 1.0A	346.5	2.15	0.96	36.8	24.9	2.56	12.0	6.1	1.6	5.0	2.6	0.7
9.Non-Magnetics 0.5A	42.4	0.26	0.12	31.3	35.8	13.7	1.3	1.1	1.0	0.5	0.5	0.5
10.Magnetics	131.5	0.82	0.36	18.6	48.9	34.6	2.3	4.6	8.0	1.0	1.9	3.6
11.Table Midds	1504.5	9.35	4.16	24.0	22.6	7.60	34.1	24.1	20.0	14.1	10.1	9.1
12.Table Tails.	14066.1	87.42	38.85	3.79	6.42	2.82	50.3	64.1	69.5	20.9	26.8	31.4
-65 mesh (calc.)	16091.0	100.00	44.45	6.58	8.76	3.55	100.0	100.0	100.0	41.5	41.8	45.3
Head Calc.	36202.2		100.00	7.05	9.31	3.49				100.0	100.0	100.0
COMBINED PRODUCTS												
-20+65 M Non-Magnetics 0.5A(1+2)		4.55	2.53	36.7	24.3	2.48	22.5	11.3	3.3	13.2	6.6	1.8
Table Conc(1-3)		4.93	2.74	35.4	25.8	4.64	23.5	13.0	6.7	13.8	7.6	3.6
Table Midds(4-6)		9.61	5.34	25.4	19.4	4.37	32.8	19.1	12.2	19.2	11.1	6.7
Comb.Table Concs(1-4)		8.66	4.81	35.4	25.4	4.69	41.3	22.6	11.8	24.2	13.1	6.5
-65 mesh Non-Magnetics 0.5A(8+9)		2.42	1.07	36.2	26.1	3.77	13.3	7.2	2.6	5.5	3.0	1.2
Table Conc(8-10)		3.23	1.44	31.8	31.9	11.55	15.6	11.8	10.5	6.5	5.0	4.6
Combined Table Concs(1-4,8-10)			6.25	34.5	26.9	6.27	56.9	34.4	22.4	30.6	18.1	11.2

Tests 7, 8 and 9 - Continued

SCREEN ANALYSIS - Combined Products (Reground +65M Table Middling)

Mesh Size (Tyler)	% Retained		% Passing
	Individual	Cumulative	Cumulative
+ 35	0.6	0.6	99.4
48	8.1	8.7	91.3
65	19.7	28.4	71.6
100	28.1	56.5	43.5
150	18.8	75.3	24.7
200	9.5	84.8	15.2
270	5.1	89.9	10.1
400	2.9	92.8	7.2
- 400	7.2	100.0	-
Total	100.0	-	-

TEST NO. 10

Purpose: To produce a high grade Cr concentrate from a composite of the Ore Sorters "Accept" fractions, using tabling followed by magnetic separation.

Feed Preparation: A 10 kg charge of -10 mesh Ore Sorters Accept composite was sized on 20 mesh and stage ground in a large (10 kg) rod mill to minus 20 mesh.

The ground product was screened on a 65 mesh screen to produce a -20 plus 65 mesh fraction and a minus 65 mesh fraction.

Procedure:

Minus 65 Mesh Fraction

The minus 65 mesh slurry was hand fed to a Wilfley shaking table. The table middling was recirculated to the feed during operation. The table concentrate was further upgraded by passing it through the Jeffrey wet drum magnetic separator.
The first pass was conducted at 1.0 amps with the 1.0 amp magnetics reprocessed at 0.5 amps.
See flowsheet Tests 7, 8 and 9.

Minus 20 Plus 65 Mesh Fraction

The minus 20 plus 65 mesh product was hand fed to a Wilfley shaking table. The table middling was recirculated to the feed during operation. The table concentrate was further upgraded by passing it through the Jeffrey wet drum magnetic separator. The first pass was conducted at 1.0 amps with a second pass at 0.5 amps deleted due to insufficient feed. The table middling was reground and tabled again to form a middlings concentrate. See flowsheet from Tests 7, 8 and 9.

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TEST NO : 10
SIZE FRACTION : minus 20 Mesh, Ore Sorting Accept Composite

PRODUCT		WEIGHT g	WEIGHT % IND.	WEIGHT % O'ALL	ASSAY % Cr2O3	ASSAY % Fe	ASSAY % Mag Fe	% DISTRIBUTION (Ind.) Cr2O3	% DISTRIBUTION (Ind.) Fe	% DISTRIBUTION (Ind.) Mag Fe	% DISTRIBUTION (Overall) Cr2O3	% DISTRIBUTION (Overall) Fe	% DISTRIBUTION (Overall) Mag Fe
-20+65 M	1.Non-Magnetics 1.0A	115.6	1.96	0.75	38.4	23.9	1.95	6.1	4.4	1.7	3.8	1.8	0.5
	2.Magnetics	6.5	0.11	0.04	21.1	44.6	29.3	0.2	0.5	1.5	0.1	0.2	0.4
	3.Rotable Conc.	190.6	3.23	1.23	38.3	24.10	2.81	10.1	7.3	4.1	6.2	3.1	1.1
	4.Rotable Midds.	1290.5	21.90	8.36	30.1	19.30	2.48	53.7	39.8	24.5	33.1	16.6	6.5
	5.Rotable Tail.	266.4	4.52	1.73	7.07	7.66	2.06	2.6	3.3	4.2	1.6	1.4	1.1
	6.Table Tails.	4022.0	68.27	26.05	4.90	6.97	2.08	27.3	44.8	64.0	16.8	18.7	17.0
-20+65 M	(calc.)	5891.6	100.00	38.16	12.27	10.63	2.22	100.0	100.0	100.0	61.5	41.7	26.6
-65 mesh	7.Non-Magnetics 1.0A	277.8	7.55	1.80	39.9	24.9	2.25	35.0	21.0	7.3	9.4	4.6	1.3
	8.Non-Magnetics 0.5A	18.3	0.50	0.12	31.6	36.3	15.0	1.8	2.0	3.2	0.5	0.4	0.6
	9.Magnetics	29.5	0.80	0.19	20.1	47.6	32.9	1.9	4.3	11.3	0.5	0.9	2.0
	10.Table Midds	694.4	18.87	4.50	18.5	14.7	3.58	40.5	31.0	29.0	10.9	6.8	5.1
	11.Table Tails.	2659.5	72.28	17.23	2.48	5.15	1.59	20.8	41.6	49.3	5.6	9.1	8.6
-65 mesh	(calc.)	3679.8	100.00	23.84	8.61	8.94	2.33	100.0	100.0	100.0	27.0	21.9	17.5
Head Calc.		9571.1		62.00	10.87	9.98	2.26				86.5	63.6	44.1
COMBINED PRODUCTS													
-20+65 M	Table Conc(1+2)		2.07	0.79	37.5	25.0	3.40	6.3	4.9	3.2	3.9	2.0	0.8
	Table Midds(3-5)		29.66	11.32	27.5	18.0	2.45	66.4	50.4	32.8	40.9	21.0	9.7
	Comb Table Concs.(1-3)		5.31	2.03	38.0	24.5	3.04	16.4	12.2	7.3	10.1	5.1	1.9
-65 mesh	Non-Magnetics 0.5A(7+8)		8.05	1.92	39.4	25.6	3.04	35.8	23.1	10.5	9.9	5.0	1.8
	Table Conc(7-9)		8.85	2.11	37.6	27.6	5.74	33.7	27.3	21.8	10.4	6.0	3.8
Combined Table Concs(1-3,7-9)				4.13	37.8	26.1	4.42	55.1	39.5	29.1	20.5	11.1	5.7

Test No. 10 - Continued

SCREEN ANALYSIS - Combined Product -(Reground +65M Table Middling)

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 48	2.8	2.8	97.2
65	29.1	31.9	68.1
100	32.0	63.9	36.1
150	16.3	80.2	19.8
200	7.8	88.0	12.0
270	4.2	92.2	7.8
400	2.4	94.6	5.4
- 400	5.4	100.0	-
Total	100.0	-	-

TEST NO. 11

Purpose: To remove a high grade Cr_2O_3 concentrate by flotation from the gravity reject product.

Procedure: As indicated below.

Feed: 2 kg table tail composite (Tests 7, 8 and 9).

Grind: Stage grind in rod mill to minus 150 mesh. (in each stage, the sample was screened at 150M and the oversize was returned to the mill)

Conditions:

Stage	Reagents Added, grams/tonne					Time, minutes		pH
	H_2SO_4	Na_2SiF_6	FA3	825	DF250	Cond.	Froth	
Stage grind to minus 150 mesh.						10+10+10+20 minutes		
Table on Wilfley to produce a high grade gravity concentrate.								
Deslime 3 times	Dilute to 8 L. Remove. Condition 1 kg Na_2CO_3 each stage 2 minutes. Stand 5 minutes, siphon.							
Rougher Cond. 1	1000	-	-	-	-	10	-	6.0
2	-	1000	-	-	-	10	-	4.2-6.3
3	-	-	250	50	10	5	-	-
Float	-	-	-	-	-	1	5	-
Scav. Cond.	-	-	125	25	-	5	3	-
Ro. Conc. 1st Cl.	-	1000	-	-	-	10	5	4.6
Ro. Conc. 2nd Cl.	-	500	-	-	-	5	3	4.4
Ro. Conc. 3rd Cl.	-	500	-	-	-	10	5	3.9

Stage	Rougher Condition	Rougher + Scavenger	Cleaners
Flotation Cell	1000 g D-1	1000 g D-1	500 g D-1
Speed rpm	1800	1800	1200
% Solids	50	33	-

TEST NO.: 11
FEED: Combined Table Middlings and Tailings from tests 7 - 9

	WEIGHT	WEIGHT %		ASSAY %			% DISTRIBUTION (Ind.)			% DISTRIBUTION (Overall)		
	g	IND.	O'ALL	Cr2O3	Fe	Mag Fe	Cr2O3	Fe	Mag Fe	Cr2O3	Fe	Mag Fe
1.Table Conc.	21.4	1.11	1.04	28.1	29.9	12.2	7.4	3.9	4.0	5.1	3.2	3.5
2.Cleaner Conc.	3.3	0.17	0.16	10.3	29.8	19.7	0.4	0.6	1.0	0.3	0.5	0.9
3.3rd Cl. Tail.	14.2	0.74	0.69	13.6	28.20	17.90	2.4	2.5	3.9	1.6	2.0	3.4
4.2nd Cl. Tail.	64.9	3.38	3.16	13.9	23.70	13.50	11.1	9.5	13.3	7.7	7.8	11.8
5.1st Cl. Tail.	364.6	18.96	17.78	6.29	10.60	4.59	28.2	23.8	25.5	19.5	19.5	22.6
6.Scav. Conc.	22.7	1.18	1.11	5.21	12.0	5.97	1.5	1.7	2.1	1.0	1.4	1.8
7.Scav. Tail.	556.1	28.92	27.11	3.89	7.69	2.87	26.6	26.3	24.3	18.4	21.6	21.6
8.Slimes	875.7	45.54	42.69	2.09	5.08	1.95	22.5	31.7	26.0	15.6	26.0	23.1
Head (calc.)	1922.9	100.00	93.75	4.23	8.45	3.42	100.0	100.0	100.0	69.3	81.9	88.8

COMBINED PRODUCTS

Comb. Table + Cl. Concs.(1+2)		1.28	1.20	25.7	29.9	13.20	7.8	4.5	5.0	5.4	3.7	4.4
2nd Cl. Conc.(2+3)		0.91	0.85	13.0	28.5	18.24	2.8	3.1	4.9	1.9	2.5	4.3
1st Cl. Conc.(2-4)		4.29	4.02	13.7	24.7	14.51	13.9	12.5	18.2	9.6	10.3	16.2
Rougher Conc.(2-5)		23.25	21.79	7.66	13.2	6.42	42.1	36.3	43.7	29.2	29.8	38.8
Ro. + Scav. Concs.(2-6)		24.43	22.90	7.54	13.1	6.40	43.5	38.0	45.7	30.2	31.1	40.6
Rougher Tail(6+7)		30.10	28.22	3.94	7.86	2.99	28.0	28.0	26.4	19.4	22.9	23.4
Flotation Feed(2-7)		53.35	50.01	5.56	10.2	4.48	70.1	64.4	70.0	48.6	52.7	62.2

Test No. 11 - Continued

SIZE ANALYSIS - Slimes

Particle Size	% Retained		% Passing Cumulative
	Individual	Cumulative	
+ 29.7 µm	1.0	1.0	99.0
20.7	10.4	11.4	88.6
14.3	17.0	28.4	71.6
11.0	10.2	38.6	61.4
- 11.0	61.4	100.0	-
Total	100.0	-	-

Specific Gravity 2.80

TEST NO. 12

Purpose: To produce a high grade Cr concentrate from a composite of the Ore Sorters "Reject" fractions, using tabling followed by magnetic separation.

Feed Preparation: A 10 kg charge of -10 mesh Ore Sorters Reject composite was sized on 20 mesh and stage ground in a large (10 kg) and small (2 kg) rod mill to minus 20 mesh.
The ground product was screened on a 65 mesh screen to produce a -20 plus 65 mesh fraction and a minus 65 mesh fraction.

Procedure:

Minus 65 Mesh Fraction

The minus 65 mesh slurry was hand fed to a Wilfley shaking table. The table middlings were recirculated to the feed during operation. The table concentrate was further upgraded by passing it through the Jeffrey wet drum magnetic separator. The first pass was conducted at 1.0 amps with the 1.0 amp magnetics reprocessed at 0.5 amps.
See Flowsheet from Tests 7, 8 and 9.

Minus 20 Plus 65 Mesh Fraction

The minus 20 + 65 mesh sands were hand fed to a Wilfley shaking table. The table middling was recirculated to the feed during operation. The table concentrate was further upgraded by passing it through the Jeffrey wet drum magnetic separator.
The first pass was conducted at 1.0 amps with the 1.0 amp magnetics reprocessed at 0.5 amps. The table middling was reground and tabled again to form a middlings concentrate.
See Flowsheet from Tests 7, 8 and 9.

TEST NO : 12

SIZE FRACTION : minus 20 Mesh, Ore Sorting Reject Composite

PRODUCT		WEIGHT	WEIGHT %		ASSAY %			% DISTRIBUTION (Ind.)			% DISTRIBUTION (Overall)		
		g	IND.	O'ALL	Cr2O3	Fe	Mag Fe	Cr2O3	Fe	Mag Fe	Cr2O3	Fe	Mag Fe
-20+65 M	1.Non-Magnetics 1.0A	24.4	0.36	0.10	28.7	22.0	3.08	4.4	0.9	0.3	0.4	0.2	0.1
	2.Non-Magnetics 0.5A	8.4	0.12	0.03	33.2	25.7	4.73	1.8	0.4	0.1	0.1	0.1	.0
	3.Magnetics	52.1	0.78	0.21	26.1	36.1	17.6	8.7	3.2	2.9	0.7	0.8	1.1
	4.Rotable Conc.	69.4	1.02	0.27	26.2	38.2	20.3	11.5	4.4	4.3	0.9	1.1	1.7
	5.Rotable Midds.	617.7	9.26	2.21	6.63	14.2	7.89	23.5	13.4	13.7	1.9	3.4	5.3
	6.Rotable Tail.	23.2	0.34	0.09	2.21	8.85	4.89	0.3	0.3	0.3	.0	0.1	0.1
	7.Table Tails.	5869.7	88.12	23.79	1.30	7.63	4.19	49.8	77.4	78.3	4.1	19.5	30.1
-20+65 M	(calc.)	6669.5	100.00	26.69	2.33	8.78	4.77	100.0	100.0	100.0	8.3	25.2	30.4
-65 mesh	8.Non-Magnetics 1.0A	16.1	0.56	0.06	29.5	25.3	4.66	7.6	1.5	0.5	0.2	0.2	0.1
	9.Non-Magnetics 0.5A	29.2	1.01	0.11	31.5	33.1	11.1	14.8	3.6	2.2	0.5	0.4	0.4
	10.Magnetics	47.2	1.64	0.19	16.2	51.9	38.3	12.3	9.2	12.2	0.4	1.0	2.1
	11.Table Midds	741.2	25.69	2.91	2.94	11.1	6.75	35.0	30.9	33.8	1.1	3.5	5.9
	12.Table Tails.	2051.4	71.10	8.04	0.92	7.11	3.70	30.3	54.8	51.3	1.0	6.1	9.0
-65 mesh	(calc.)	2885.0	100.00	11.31	2.16	9.23	5.13	100.0	100.0	100.0	3.2	11.2	17.5
Head Calc.		9694.9		38.00	2.28	8.02	4.87				11.5	36.4	55.6
COMBINED PRODUCTS													
-20+65 M	Non-Magnetics 0.5A(1+2)		0.48	0.13	29.9	22.9	4.10	6.2	1.3	0.4	0.5	0.3	0.2
	Table Conc (1-3)		1.26	0.34	27.5	31.1	12.44	14.9	4.5	3.3	1.2	1.1	1.3
	Table Midds(4-6)		10.62	2.57	8.5	16.6	9.10	35.3	18.1	18.4	2.9	4.6	7.1
	Comb.Table Concs(1-4)		2.28	0.61	26.9	34.3	15.95	26.4	8.9	7.6	2.2	2.2	2.9
-65 mesh	Non-Magnetics 0.5A(8+9)		1.57	0.18	30.8	30.3	8.81	22.4	5.2	2.7	0.7	0.6	0.5
	Table Conc(8-10)		3.21	0.36	23.3	41.3	23.86	34.7	14.4	14.9	1.1	1.6	2.6
Combined Table Concs(1-4,8-10)				0.97	25.6	36.9	18.91	61.1	23.2	23.5	3.3	4.8	5.5

Test No. 12 - Continued

SCREEN ANALYSIS - Retabled Middlings

Mesh Size (Tyler)	% Retained		% Passing Cumulative
	Individual	Cumulative	
+ 65	5.3	5.3	94.7
100	39.0	44.3	55.9
150	34.0	78.3	21.7
200	13.6	91.9	8.1
270	5.1	97.0	3.0
400	1.8	98.8	1.2
- 400	1.2	100.0	-
Total	100.0	-	-

Combined Products (Reground +65M Table Middling)

+ 65	0.2	0.2	99.8
100	0.5	0.7	99.3
150	1.0	1.7	98.3
200	16.0	17.7	82.3
270	23.6	41.3	58.7
400	27.4	68.7	31.3
- 400	31.3	100.0	-
Total	100.0	-	-

TEST NO. 13

Purpose: To float a chromite concentrate at increased Na_2SiF_6 concentration.

Procedure: As indicated below.

Feed: 2kg table tail composite (Tests 7, 8, 9).

Grind: Stage grind in rod mill to minus 150 mesh.

Conditions:

Stage	Reagents Added, g/t			Time, minutes		pH
	Na_2SiF_6	FA3	825	Cond.	Froth	
Stage grind to minus 150 mesh 30 + 20 minute stages. Deslime 3 times.						
Dilute to 8 L Condition 2 minutes c̄ 1000 g/t Na_2CO_3 Settle 10 minutes and siphon.						
Rougher Cond.	2000	-	-	10	-	5.7-6.3
Rougher 1	-	1000*	100	5	3	6.4
2	-	500	50	3	3	-

*stage additions

Comments:

Flotation slow and unselective.
Appears over depressed necessary to increase collector to achieve flotation.
Good liberation of minerals.

TEST NO.: 13
FEED: Combined Table Middlings and Tailings from tests 7 - 9

	WEIGHT	WEIGHT %		ASSAY %			% DISTRIBUTION (Ind.)			% DISTRIBUTION (Overall)		
	g	IND.	O'ALL	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe
Ro. Conc. 1	87.4	4.40	4.12	4.38	12.2	6.82	5.0	6.7	8.8	3.5	5.5	7.8
Ro. Conc. 2	276.1	13.89	13.02	6.32	12.50	6.64	22.8	21.6	27.0	15.8	17.7	24.0
Ro. Tailing	911.9	45.87	43.00	4.83	8.99	3.93	57.6	51.4	52.7	39.9	42.1	46.8
Slimes	712.8	35.85	33.61	1.56	4.54	1.10	14.5	20.3	11.5	10.1	16.6	10.2
Head (calc.)	1988.2	100.00	93.75	3.84	8.02	3.42	100.00	100.00	100.00	69.3	61.9	88.8

COMBINED PRODUCTS

	WEIGHT g	WEIGHT % IND.	WEIGHT % O'ALL	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe
Ro. Conc. 1+2		18.28	17.14	5.9	12.4	6.68	27.8	28.3	35.7	19.3	23.2	31.7
Flot. Feed		64.15	60.14	5.1	10.0	4.71	85.5	79.7	88.5	59.2	65.3	78.6

TEST NO. 14

Purpose: To produce a high grade Cr concentrate from the magnetics "Accept" composite using tabling followed by magnetic separation.

Feed Preparation: A 12.730 kg charge of -10 mesh magnetic separation Accept composite was sized on 20 mesh and stage ground in a large (10 kg) rod mill to minus 20 mesh.
The ground product was screened on a 65 mesh screen to produce a -20 plus 65 mesh fraction and a minus 65 mesh fraction.

Procedure: **Minus 65 Mesh Fraction**

The minus 65 mesh slurry was hand fed to a Wilfley shaking table. The table middlings were recirculated to the feed during operation. The table concentrate was further upgraded by passing it through the Jeffrey wet drum magnetic separator. The first pass was conducted at 1.0 amps with the 1.0 amp magnetics reprocessed at 0.5 amps.
See flowsheet from Tests 7, 8 and 9.

Minus 20 Plus 65 Mesh Fraction

The minus 20 + 65 mesh sands were hand fed to a Wilfley shaking table. The table middling was recirculated to the feed during operation. The table concentrate was further upgraded by passing it through the Jeffrey wet drum magnetic separator. The concentrate was passed at 1.0 amps. A second pass was deleted due to the small amounts of magnetics produced. The table middling was reground and tabled again to form a middlings concentrate, midds and tails.
See flowsheet from Tests 7, 8 and 9.

TEST NO : 14
SIZE FRACTION : minus 20 Mesh, Magnetic Sep'n Accept Composite

PRODUCT		WEIGHT g	WEIGHT % IND.	WEIGHT % O'ALL	ASSAY % Cr_2O_3	ASSAY % Fe	ASSAY % Mag Fe	% DISTRIBUTION (Ind.) Cr_2O_3	% DISTRIBUTION (Ind.) Fe	% DISTRIBUTION (Ind.) Mag Fe	% DISTRIBUTION (Overall) Cr_2O_3	% DISTRIBUTION (Overall) Fe	% DISTRIBUTION (Overall) Mag Fe
-20+65 M	1.Non-Magnetics 1.0A	163.6	2.17	0.86	39.3	23.7	1.63	8.7	5.9	2.2	5.0	2.1	0.4
	2.Magnetics	12.9	0.17	0.07	32.7	29.8	8.6	0.6	0.6	0.9	0.3	0.2	0.2
	3.Rotable Conc	178.5	2.37	0.94	39.5	23.70	1.92	9.6	6.4	2.8	5.5	2.3	0.5
	4.Rotable Midds	1261.4	16.73	6.63	27.2	16.90	1.52	46.5	32.1	15.9	26.6	11.7	2.9
	5.Rotable Tail	279.7	3.71	1.47	4.68	5.63	1.27	1.8	2.4	2.9	1.0	0.9	0.5
	6.Table Tails.	5641.3	74.84	29.64	4.30	6.19	1.61	32.9	52.7	75.2	18.8	19.2	13.8
-20+65 M	(calc.)	7537.6	100.00	39.60	9.79	8.80	1.60	100.0	100.0	100.0	57.1	36.5	18.3
-65 mesh	7.Non-Magnetics 1.0A	133.7	3.04	0.70	40.2	23.8	1.98	17.1	9.3	3.2	4.2	1.6	0.4
	8.Non-Magnetics 0.5A	18.4	0.42	0.10	37.5	26.9	4.8	2.2	1.5	1.1	0.5	0.3	0.1
	9.Magnetics	16.1	0.37	0.08	25.3	39.5	20.1	1.3	1.9	3.9	0.3	0.4	0.5
	10.Table Midds	974.6	22.17	5.12	17.5	13.3	2.38	54.3	38.0	28.3	13.2	7.1	3.5
	11.Table Tails.	3253.5	74.01	17.09	2.42	5.17	1.60	25.1	49.3	63.5	6.1	9.3	7.9
-65 mesh	(calc.)	4396.1	100.00	23.10	7.14	7.76	1.87	100.0	100.0	100.0	24.3	19.8	12.5
Head Calc.		11933.7		62.70	8.81	8.41	1.70				81.4	55.3	30.8

COMBINED PRODUCTS

PRODUCT		WEIGHT g	WEIGHT % IND.	WEIGHT % O'ALL	ASSAY % Cr_2O_3	ASSAY % Fe	ASSAY % Mag Fe	% DISTRIBUTION (Ind.) Cr_2O_3	% DISTRIBUTION (Ind.) Fe	% DISTRIBUTION (Ind.) Mag Fe	% DISTRIBUTION (Overall) Cr_2O_3	% DISTRIBUTION (Overall) Fe	% DISTRIBUTION (Overall) Mag Fe
-20+65 M	Table Conc(1+2)		2.34	0.93	38.9	24.1	2.14	9.3	6.4	3.1	5.3	2.3	0.6
	Table Midds(3-5)		22.81	9.04	24.8	15.8	1.52	57.8	40.9	21.7	33.0	14.9	4.0
	Comb.Table Concs(1-3)		4.71	1.87	39.2	23.9	2.03	18.9	12.9	6.0	10.6	4.7	1.1
-65 mesh	Non-Magnetics 0.5A(7+8)		3.46	0.80	39.0	24.2	2.32	19.3	10.9	4.3	4.7	2.0	0.5
	Table Conc(7-9)		3.83	0.88	38.5	25.6	4.02	20.6	12.7	8.2	5.0	2.4	1.0
Combined Table Concs(1-3,7-9)				2.75	38.9	24.5	2.67	39.5	25.5	14.2	15.8	7.1	2.1

Test No. 14 - Continued

SCREEN ANALYSIS - Combined Products (Reground +65M Table Middling)

Mesh Size (Tyler)	% Retained		% Passing
	Individual	Cumulative	Cumulative
+ 35	0.4	0.4	99.6
48	7.6	8.0	92.0
65	31.1	39.1	60.9
100	33.2	72.3	27.7
150	14.6	86.9	13.1
200	5.4	92.3	7.7
270	2.6	94.9	5.1
400	1.6	96.5	3.5
- 400	3.5	100.0	-
Total	100.0	-	-

TEST NO. 15

Purpose: To float a chromite concentrate at reduced Na_2SiF_6.

Procedure: As indicated below.

Feed: 2 kg table tail composite (Tests 7, 8 and 9).

Grind: Stage grind in rod mill to minus 150 mesh.

Conditions:

Stage	Reagents Added, g/t					Time, minutes		pH
	H_2SO_4	Na_2SiF_6	FA3	825	DF250	Cond.	Froth	
Stage grind to minus 150 mesh (30 + 20 minute stage).								
Deslime 3 times - dilute to 8 L - condition 2 minutes $\bar{c}$ 1000 g/t Na_2CO_3 - settle 10 minutes and siphon								
Ro. Cond. 1	1000	-	-	-	-	5	-	-
Ro. Conc. 2	-	500	-	-	-	5	-	6.1
	-	-	250	50	8	5	3	-
	100	-	-	-	-	1	-	-
	-	-	250	50	-	3	2	5.8
	-	-	-	-	4	-	3	-

Comments:
- lacks selectivity
- heavy froth product Rougher 2
- fine chromite floating with serpentine

TEST NO.: 15
FEED: Combined Table Middlings and Tailings from tests 7 - 9

	WEIGHT	WEIGHT %		ASSAY %			% DISTRIBUTION (Ind.)			% DISTRIBUTION (Overall)		
	g	IND.	O'ALL	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe
Ro. Conc. 1	160.2	8.27	7.76	5.25	10.7	5.6	10.1	10.8	13.6	7.0	8.8	12.1
Ro. Conc. 2	612.7	31.64	29.67	8.11	12.90	6.16	59.7	49.7	57.3	41.4	40.7	50.9
Ro. Tailing	428.2	22.12	20.73	3.06	6.85	2.58	15.8	18.5	16.8	10.9	15.1	14.9
Slimes	735.1	37.97	35.59	1.63	4.55	1.1	14.4	21.0	12.3	10.0	17.2	10.9
Head (calc.)	1936.2	100.00	93.75	4.30	8.21	3.40	100.00	100.00	100.00	69.3	81.9	88.8
COMBINED PRODUCTS												
Ro. Conc. 1+2		39.92	37.42	7.5	12.4	6.04	69.8	60.5	70.9	48.4	49.6	63.0
Flot. Feed		62.03	58.16	5.9	10.4	4.81	85.6	79.0	87.7	59.3	64.7	77.9

TEST NO. 16

Purpose: To produce a high grade Cr concentrate from the Magnetics "Reject" Composite using tabling followed by magnetic separation.

Feed Preparation: A 6.982 kg charge of -10 mesh magnetic separation reject composite was sized on 20 mesh and stage ground in a small (2kg) rod mill to minus 20 mesh.
The ground product was screened on a 65 mesh screen to produce a -20 plus 65 mesh fraction and a minus 65 mesh fraction.

Procedure: The procedure used was the same as for Test 12.

TEST NO : 16
SIZE FRACTION : minus 20 Mesh, Magnetic Sep'n Reject Composite

PRODUCT	WEIGHT g	WEIGHT % IND.	WEIGHT % O'ALL	ASSAY % Cr2O3	ASSAY % Fe	ASSAY % Mag Fe	% DISTRIBUTION (Ind.) Cr2O3	% DISTRIBUTION (Ind.) Fe	% DISTRIBUTION (Ind.) Mag Fe	% DISTRIBUTION (Overall) Cr2O3	% DISTRIBUTION (Overall) Fe	% DISTRIBUTION (Overall) Mag Fe
-20+65 M 1.Non-Magnetics 1.0A	86.5	2.19	0.47	27.7	22.8	4.67	17.2	4.4	1.6	1.9	1.1	0.6
2.Non-Magnetics 0.5A	32.2	0.82	0.18	27.1	30.4	11	6.3	2.2	1.4	0.7	0.6	0.6
3.Magnetics	23.7	0.60	0.13	16.5	41.0	27.1	7.8	2.2	2.5	0.3	0.6	1.0
4.Rotable Conc.	79.2	2.01	0.43	27.2	38.7	20.50	15.4	6.8	6.4	1.7	1.8	2.6
5.Rotable Midds.	419.2	10.61	2.30	7.06	16.9	9.77	21.1	15.8	16.1	2.3	4.1	6.5
6.Rotable Tail.	271.4	[illegible]	1.49	1.71	9.49	5.31	2.3	5.8	5.7	0.4	1.5	2.3
7.Table Tails.	3032.0	76.80	16.65	1.56	9.28	5.57	[illegible]	62.9	66.4	3.8	16.3	26.9
-20+65 M (calc.)	3947.2	100.00	21.65	3.54	11.35	6.45	100.0	100.0	100.0	11.1	26.0	40.6
-65 mesh 8.Non-Magnetics 1.0A	48.3	[illegible]	0.26	33.4	26.0	3.97	17.0	3.9	1.1	1.3	0.7	0.3
9.Non-Magnetics 0.5A	20.2	0.71	0.11	32.1	30.8	8.6	6.9	1.9	1.0	0.5	0.4	0.3
10.Magnetics	72.8	[illegible]	0.40	18.9	46.3	31.1	14.6	10.5	12.6	1.1	2.0	3.6
11.Table Midds	734.6	[illegible]	4.58	4.25	14.5	9.12	37.6	37.5	42.4	2.8	7.6	12.1
12.Table Tails.	1974.3	69.27	10.26	1.20	7.95	4.12	23.9	46.2	43.0	1.8	8.6	12.3
-65 mesh (calc.)	2849.9	100.00	15.65	3.31	11.31	6.30	100.0	100.0	100.0	7.5	18.7	29.6
Head Calc.	6797.1		37.30	3.44	11.34	6.39				18.6	44.7	69.2
COMBINED PRODUCTS												
-20+65 M Non-Magnetics 0.5A(1+2)		3.01	0.65	27.5	24.9	6.39	23.4	6.6	3.0	2.6	1.7	1.2
Table Conc(1-3)		3.61	0.78	25.7	27.5	9.83	26.2	8.8	5.9	2.9	[illegible]	2.2
Table Midds(4-6)		19.50	4.22	7.2	16.5	9.30	39.9	28.4	29.1	4.4	7.4	11.4
Comb.Table Concs(1-4)		5.62	1.22	26.2	31.5	13.65	41.6	15.6	[illegible]	4.6	4.1	4.8
-65 mesh Non-Magnetics 0.5A(8+9)		2.40	0.37	33.0	27.4	5.35	23.9	5.8	2.0	1.8	1.1	0.6
Table Conc(8-10)		[illegible]	0.77	29.7	37.2	18.65	38.5	16.3	14.7	2.9	3.0	4.2
Combined Table Concs(1-4,8-10)			1.99	26.0	33.7	15.50	80.2	31.9	26.5	7.5	7.1	9.0

Test No. 16 - Continued

SCREEN ANALYSIS - Combined Products (Middlings)

Mesh Size (Tyler)	% Retained		% Passing Cumulative
	Individual	Cumulative	
+ 48	1.6	1.6	98.4
65	15.9	17.5	82.5
100	37.4	54.9	45.1
150	18.1	73.0	27.0
200	7.2	80.2	19.8
270	4.2	84.4	15.6
400	3.2	87.6	12.4
- 400	12.4	100.0	-
Total	100.0	-	-

TEST NO. 17

Purpose: To produce a non ferrous chromite concentrate.

Procedure: Two kilograms of -20 mesh material was dry screened on a 65 mesh Tyler sieve. The -65 mesh fraction was assayed and the +65 mesh fraction was passed through the Carpco magnetic separator. The resulting magnetics were then repassed at a lower amperage.

The final non-magnetic fraction was then subjected to a high intensity Lurgi magnetic separation. The Lurgi non-magnetics were assayed and a Carpco electrostatic separation was performed on the Lurgi magnetics. Several attempts on the electrostatic separator were made before the best settings were found. After 3 passes all the electrostatic products were recombined, washed, dried and then repassed. This produced somewhat better results as all particles had a coating of very fine dust prior to washing.

The -65 mesh fraction, Carpco magnetics, Lurgi non-magnetics and the electrostatic conductor, middlings and non-conductor were all assayed for Cr_2O_3, Total Fe and Magnetic Fe.

Conditions for Carpco Low Intensity Magnetic Separator

Drive Speed: 60 rpm
Amperage : 0.2 and 0.1 for repassing magnetics
Splitter Setting: 5

Conditions for Lurgi Magnetic Separation

Amperage: 0.5

Conditions for Carpco Electrostatic Separator

Drive Speed: 40 rpm
Voltage: 40 kV
Splitter 1: 64
Splitter 2: 35
Discharge Arm: 2 3/4

TEST NO.: 17
FEED: Minus 20 Mesh

	WEIGHT g	WEIGHT %	ASSAY % Cr2O3	ASSAY % Fe	ASSAY % Mag Fe	% DISTRIBUTION Cr2O3	% DISTRIBUTION Fe	% DISTRIBUTION Mag Fe
Non-conductors	71.2	3.64	8.89	10.4	3.31	6.2	4.9	4.5
Middling	143.5	7.35	3.67	7.33	2.90	5.1	7.0	8.0
Conductors	46.9	2.40	0.87	5.63	2.53	0.4	1.8	2.3
Lurgi Non-mags	618.4	31.65	5.53	4.96	0.36	33.4	20.5	4.3
Carpco Mags	255.7	13.09	8.08	16.0	8.62	20.2	27.3	42.4
Minus 65 Mesh	818.0	41.87	4.35	7.04	2.44	34.7	38.5	38.4
Head (calc.)	1953.7	45.04	5.24	7.66	2.66	100.00	100.00	100.00

COMBINED PRODUCTS

	WEIGHT %	ASSAY % Cr2O3	ASSAY % Fe	ASSAY % Mag Fe	% DISTRIBUTION Cr2O3	% DISTRIBUTION Fe	% DISTRIBUTION Mag Fe
Cond.+Middling	10.99	5.40	8.35	3.04	11.32	11.97	12.55
Lurgi Mags	13.39	4.59	7.86	2.95	11.72	13.73	14.84
Carpco Non-mags	45.04	5.25	5.82	1.13	45.10	34.22	19.12
Plus 65 Mesh	58.13	5.89	8.11	2.82	65.27	61.54	61.57

TEST NO. 18

Purpose: To produce a high grade Cr concentrate from the heavy liquid "Reject" composite using tabling followed by magnetic separation.

Feed Preparation: A 2.191 kg charge of -10 mesh Heavy Liquid Sep'n Reject composite was sized on 20 mesh and stage ground in a small (2 kg) rod mill to minus 20 mesh.
The ground product was screened on a 65 mesh screen to produce a -20 plus 65 mesh fraction and a minus 65 mesh fraction.

Procedure:

Minus 65 Mesh Fraction

The minus 65 mesh slurry was passed over a Wilfley table to form a table concentrate, middling and tailing. The table concentrate was passed through the Jeffrey wet magnetic separator at a 1.0 amp setting. No further upgrading was completed due to sample size.
See flowsheet from Tests 7, 8 and 9.

Minus 20 Plus 65 Mesh Fraction

The minus 65 mesh sands were passed over a Wilfley table to form a table concentrate, middling, and tailing. The table concentrate was passed through the Jeffrey wet magnetic separator at a 1.0 amp setting.
The table middlings was reground in the small lab rod mill and passed over the Wilfley table to form a middlings concentrate, middlings and tailings.
See flowsheet from Tests 7, 8 and 9.

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TEST NO. : 1[illegible]

SIZE FRACTION : minus 20 Mesh, Heavy Liquid Sep'n Reject Composite

PRODUCT		WEIGHT g	WEIGHT % IND.	WEIGHT % O'ALL	ASSAY % Cr2O3	ASSAY % Fe	ASSAY % Mag Fe	% DISTRIBUTION (Ind.) Cr2O3	% DISTRIBUTION (Ind.) Fe	% DISTRIBUTION (Ind.) Mag Fe	% DISTRIBUTION (Overall) Cr2O3	% DISTRIBUTION (Overall) Fe	% DISTRIBUTION (Overall) Mag Fe
-20+65 M	1.Non-Magnetics 1.04	11.2	1.03	0.29	24.0	25.0	7.40	15.7	3.6	2.1	0.9	0.7	0.5
	2.Magnetics	5.1	0.30	0.08	16.1	35.0	20.6	3.1	1.4	1.6	0.2	0.3	0.4
	3.Rotable Conc.	17.2	1.66	0.44	22.8	35.70	16.1	24.4	7.4	7.1	1.3	1.5	1.8
	4.Rotable Midds.	223.1	21.17	6.23	1.01	7.69	4.10	20.3	31.5	33.0	1.1	6.3	8.8
	5.Rotable Tail.	220.7	21.44	5.77	0.63	6.33	3.10	8.9	18.2	18.0	0.5	4.6	4.7
	6.Table Tails.	454.5	[illegible]	11.63	0.94	6.55	3.2	26.7	38.0	37.3	1.4	7.5	9.7
-20+65 M	(calc.)	[illegible]	100.00	24.44	1.55	7.59	3.77	100.0	100.0	100.0	5.3	19.8	26.0
-65 mesh	7.Non-Magnetics 1.04	17.0	1.64	0.43	24.8	23.6	5.4	23.1	4.8	2.1	1.4	1.0	0.6
	8.Magnetics	22.7	2.19	0.58	20.0	43.3	25.6	24.9	11.7	13.6	1.5	2.5	3.0
	9.Table Midds	381.6	36.87	9.72	1.08	7.50	4.02	22.6	34.0	35.8	1.4	7.2	10.2
	10.Table Tails.	613.6	59.29	15.63	0.87	6.79	3.39	29.3	49.5	48.5	1.8	10.5	13.8
-65 mesh	(calc.)	[illegible]	100.00	26.36	1.76	8.13	4.14	100.0	100.0	100.0	6.1	21.2	28.4
Head Calc.		2072.7		52.80	1.66	7.86	3.96				11.4	41.0	54.4
COMBINED PRODUCTS													
-20+65 M	Table Conc(1+2)		1.33	0.36	22.3	27.2	10.26	19.8	4.9	3.7	1.1	1.0	1.0
	Table Midds(3-5)		44.27	11.44	1.5	7.9	4.06	53.5	57.1	58.1	2.9	11.5	15.3
	Comb.Table Conc(1-3)		2.99	0.80	22.6	30.7	13.45	44.2	12.3	10.8	2.4	2.4	2.8
-65 Mesh	Table Conc(7+8)		3.83	1.01	22.1	34.9	17.0	48.1	16.5	15.7	2.9	3.5	4.5
Combined Table Concs(1-3,7+8)				1.81	22.3	33.0	15.40	92.2	28.7	26.5	5.3	5.9	7.3

Test No. 18 - Continued

SCREEN ANALYSIS - Combined Product (Middlings)

Mesh Size (Tyler)	% Retained		% Passing
	Individual	Cumulative	Cumulative
+ 65	3.4	3.4	96.6
100	25.1	28.5	71.5
150	26.0	54.5	45.5
200	11.7	66.2	33.8
270	6.2	72.4	27.6
400	4.7	77.1	22.9
- 400	22.9	100.0	-
Total	100.0	-	-

TEST NO. 19

Purpose:	To produce a high grade Cr concentrate from the Heavy Liquid "Accept"*composite using tabling followed by magnetic separation.
Feed Preparation:	A 2.201 kg charge of minus 10 mesh Heavy Liquid Separation Accept composite was sized and ground in a small (2 kg) rod mill to minus 20 mesh. The ground product was screened on a 65 mesh screen to produce a minus 20 plus 65 mesh fraction and a minus 65 mesh fraction.
Procedure:	The procedure used was the same as Test No. 10.

* includes sink fraction and fines

TEST NO : 1[illegible]

SIZE FRACTION : minus 20 Mesh, Heavy Liquid Sep'n Accept Composite

PRODUCT		WEIGHT g	WEIGHT % Ind.	WEIGHT % OALL	ASSAY % Cr2O3	ASSAY % Fe	ASSAY % Mag Fe	% DISTRIBUTION (Ind.) Cr2O3	% DISTRIBUTION (Ind.) Fe	% DISTRIBUTION (Ind.) Mag Fe	% DISTRIBUTION (Overall) Cr2O3	% DISTRIBUTION (Overall) Fe	% DISTRIBUTION (Overall) Mag Fe
-20+65 M	1.Non-Magnetics 1.0A	[illegible]	[illegible]	1.93	37.7	23.6	1.61	25.3	17.7	4.9	10.6	4.6	0.9
	2.Magnetics	[illegible]	[illegible]	0.11	21.2	40.3	23.0	0.8	1.7	4.1	0.3	0.5	0.7
	3.Rotable Conc.	[illegible]	[illegible]	2.03	37.5	27.40	5.07	26.6	21.7	16.3	11.2	5.6	2.9
	4.Rotable Midds.	[illegible]	[illegible]	7.62	13.6	12.50	3.01	36.1	37.1	36.4	15.2	9.6	6.4
	5.Rotable Tail.	[illegible]	[illegible]	3.72	5.11	7.84	2.78	6.6	11.3	16.4	2.8	2.9	2.9
	6.Table Tails.	[illegible]	[illegible]	3.22	4.02	8.39	4.30	4.5	10.5	22.0	1.9	2.7	3.9
-20+65 M	(calc.)	921.3	100.00	18.62	15.39	13.80	3.39	100.0	100.0	100.0	42.0	25.9	17.5
-65 mesh	7.Non-Magnetics 1.0A	117.4	9.31	2.66	39.0	24.7	2.19	32.6	20.0	5.8	15.2	6.6	1.6
	8.Non-Magnetics 0.5A	9.4	0.75	0.21	33.9	30.7	8.78	2.3	2.0	1.9	1.1	0.7	0.5
	9.Magnetics	16.	1.27	0.36	19.0	48.4	32.0	2.2	5.3	11.5	1.0	1.8	3.2
	10.Table Midds	[illegible]	[illegible]	8.77	13.6	13.1	4.02	37.5	35.0	35.0	17.5	11.6	9.8
	11.Table Tails.	730.8	57.98	16.57	4.89	7.47	2.79	25.5	37.7	45.9	11.9	12.5	12.9
-65 mesh	(calc.)	1260.4	100.00	28.58	11.14	11.50	3.53	100.0	100.0	100.0	46.6	33.1	28.1
Head Calc.		2081.7		47.20	12.82	12.40	3.47				88.6	59.0	45.6
COMBINED PRODUCTS													
-20+65 M	Table Conc(1+2)		10.93	2.04	36.8	24.5	2.78	26.1	19.4	9.0	11.0	5.0	1.6
	Table Midds(3-5)		71.79	13.37	14.9	13.5	3.26	69.3	70.1	69.1	29.1	18.1	12.1
	Comb.Table Concs(1-3)		21.91	4.07	37.1	26.0	3.92	52.7	41.1	25.3	22.1	10.6	4.4
-65 mesh	Non-Magnetics 0.5A(7+8)		[illegible]	2.89	38.6	25.1	2.68	34.9	22.0	7.6	16.3	7.3	2.1
	Table Conc(7-9)		11.33	3.24	36.4	27.8	5.96	37.1	27.4	19.2	17.3	9.1	5.4
Combined Table Concs(1-3,7-9)				7.31	36.8	26.8	4.83	89.8	68.4	44.5	30.4	19.7	9.8

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Test No. 19 - Continued

SCREEN ANALYSIS - Combined Product (Middlings)

Mesh Size (Tyler)	% Retained		% Passing
	Individual	Cumulative	Cumulative
+ 48	0.7	0.7	99.3
65	8.7	9.4	90.6
100	32.8	42.2	57.8
150	20.9	63.1	36.9
200	9.5	72.6	27.4
270	5.6	78.2	21.8
400	4.1	82.3	17.7
- 400	17.7	100.0	-
Total	100.0	-	-

TEST NO. 20

Purpose: To float a chromite concentrate at an alkaline pH using Al^{+++} as activator.

Procedure: As indicated below.

Feed: 500 g ground combined tail Tests 7, 8 and 9

Grind: 2000 g stage ground to minus 150 mesh and cut in 4.

Conditions:

Stage	Reagents Added, grams/tonne					Time, minutes		pH
	NaOH	Starch*	$Al_2(SO_4)_3$	AF-2	MIBC	Cond.	Froth	
Note: sample not deslimed.								
Cond. 1	-	-	-	-	-	1	-	11.0
2	-	600	-	-	-	2	-	-
3	-	-	600	-	-	1	-	-
Rougher 1	-	-	-	750	-	2	3	-
2	-	-	-	500	8	3	3	-
	-	-	-	500	8	3	3	-
3	-	-	-	1000	8	5	3	-

Comments:
- froth very slimey.
- chromite appeared depressed
- excess of collector necessary to float chromite activated serpentine

*Pearl Starch heated to 80°C and cooled

TEST NO.: 20

FEED: Combined Table Middlings and Tailings from tests 7 - 9

	WEIGHT	WEIGHT $		ASSAY $			$ DISTRIBUTION (Ind.)			$ DISTRIBUTION (Overall)		
	g	IND.	O'ALL	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe
Ro. Conc. 1	122.1	25.57	23.97	2.82	6.47	0.00	16.3	19.6	ERR	11.3	16.0	ERR
Ro. Conc. 2	84.2	17.63	16.53	4.03	7.56	0.00	16.1	15.8	ERR	11.2	12.9	ERR
Ro. Conc. 3	34.0	7.12	6.68	7.91	9.71	0.00	12.8	8.2	ERR	8.8	6.7	ERR
Ro. Tailing	237.2	49.68	46.57	4.87	9.62	0.00	54.8	56.5	ERR	38.0	46.3	ERR
Head (calc.)	477.5	100.00	93.75	4.41	8.46	0.00	100.00	100.00	ERR	69.3	81.9	88.8

COMBINED PRODUCTS

Ro. Conc. 1+2		43.20	40.50	3.3	6.9	0.00	32.4	35.3	ERR	22.5	28.9	ERR
Ro. Conc. 1-3		50.32	47.18	4.0	7.3	0.00	45.2	43.5	ERR	31.3	35.6	ERR

TEST NO. 21

Purpose: To take the -150 mesh material and separate the magnetic material from the non-magnetic material at different magnetic amperages using a Jeffrey wet drum magnetic separator. It was further separated on the Jones high intensity wet magnetic separator to recover the magnetically susceptible minerals.

Method: A two kilogram tailing sample was stage ground down to -150 mesh. The sample was then passed through a Jeffrey Wet Drum magnetic separator at 0.5 amps. The magnetics were filtered and sent for assay. The non-magnetics were allowed to settle, the clear water decanted and the test repeated at 2.5 amps. The magnetics at 2.5 amps were filtered and sent for assay. The non-magnetics settled and decanted. They were then passed through the Jones high intensity wet magnetic separator. The sample was passed through the Jones using 20 psi wash water pressure, a reverse coil amperage of 5 and the amperage setting on the transformer unit of 20. Magnetics, non-magnetics and middlings were recovered from the Jones. The three products were filtered and sent for assay.

Feed: 2 kg combined table tailing from Tests 7 to 9.

Grind: A two kilogram sample was stage ground at 50 % solids in a lab rod mill until it all passed through a 150 mesh screen.

TEST NO.: 21

FEED: Combined Table Middlings and Tailings from tests 7 - 9

	WEIGHT	WEIGHT %		ASSAY %			% DISTRIBUTION (Ind.)			% DISTRIBUTION (Overall)		
	g	IND.	O'ALL	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe
20 A. Magnetics	764.8	40.86	38.31	7.43	9.25	2.51	72.1	44.9	28.3	50.0	36.7	25.1
20 A. Middlings	179.4	9.59	8.99	0.87	3.19	0.28	2.0	3.6	0.7	1.4	3.0	0.7
20 A. Non-Mags	766.4	40.95	38.39	0.94	3.16	0.22	9.1	15.4	2.5	6.3	12.6	2.2
2.5 A. Magnetics	105.0	5.61	5.26	8.21	32.9	26.3	10.9	21.9	40.7	7.6	17.9	36.1
0.5 A. MAgnetics	56.0	2.99	2.81	8.25	40.1	33.7	5.9	14.2	27.8	4.1	11.7	24.7
Head (calc.)	1871.6	100.00	93.75	4.21	8.43	3.63	100.00	100.00	100.00	69.3	81.9	88.8

COMBINED PRODUCTS

	WEIGHT	WEIGHT %		ASSAY %			% DISTRIBUTION (Ind.)			% DISTRIBUTION (Overall)		
	g	IND.	O'ALL	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe
20 A. Mags + Midds		50.45	47.30	6.18	8.10	2.09	74.06	48.49	29.02	51.33	39.72	25.77
2.5 A. Non-Mags		91.40	85.69	3.83	5.89	1.25	83.20	63.85	31.51	57.66	52.29	27.98
0.5 A. Non-Mags		97.01	90.94	4.09	7.45	2.70	94.14	85.76	72.19	65.24	70.24	64.11

TEST NO. 22

Purpose:	To float a chromite concentrate from a combined table tailing.
Procedure:	As indicated below.
Feed:	1.0 kg table tail composite (Tests 7 to 9)
Grind:	Stage grind in rod mill to minus 150 mesh.

Conditions:

Stage	Reagents Added, g/t				Time, minutes		pH
	Na_2SiF_6	FA-3	825	H_2SO_4	Cond.	Froth	
Stage grind to minus 150 mesh (30 + 20 minute stages).							
Deslime 3 times	- dilute to 10 L - condition 2 minutes at 1000 g/t Na_2CO_3 - settle 10 minutes and siphon.						
				390	-	-	8.3-5.9
Rougher Cond.	2000	-	-	-	10	-	4.0-5.6
Rougher 1	-	400	200	-	5	3	5.5
2	-	200	-	-	2	2	5.5
3	-	200	100	-	2	2	5.5

Stage	Rougher Cond.	Rougher 1	Rougher 2	Rougher 3
Flotation Cell	500 g D-1	500 g D-1	500 g D-1	500 g D-1
Speed rpm	1200	1200	1200	1200

TEST NO.: 22
FEED: Combined Table Middlings and Tailings from tests 7 - 9

	WEIGHT	WEIGHT $			ASSAY $		$ DISTRIBUTION (Ind.)			$ DISTRIBUTION (Overall)		
	g	IND.	O'ALL	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe
Ro. Conc. 1	271.4	27.51	25.79	5.14	9.45	4.02	34.5	31.5	33.4	23.9	25.8	29.7
Ro. Conc. 2	115.7	11.73	11.00	5.91	10.8	4.89	16.9	15.4	17.3	11.7	12.6	15.4
Ro. Conc. 3	149.8	15.19	14.24	6.14	10.9	5.01	22.7	20.1	23.0	15.7	16.5	20.4
Ro. Tailing	56.7	5.75	5.39	5.22	10.1	4.69	7.3	7.0	8.2	5.1	5.8	7.2
Slimes	392.8	39.82	37.33	1.92	5.37	1.50	18.6	25.9	18.1	12.9	21.3	16.0
Head (calc.)	986.4	100.00	93.75	4.10	8.24	3.31	100.00	100.00	100.00	69.3	81.9	88.8

COMBINED PRODUCTS

Ro. Conc. 1+2		39.24	36.79	5.37	9.85	4.28	51.3	46.9	50.8	35.6	38.4	45.1
Ro. Conc. 1-3		54.43	51.03	5.58	10.1	4.48	74.1	67.0	73.8	51.3	54.9	65.5
Flot. Feed		60.10	56.42	5.55	10.1	4.50	81.4	74.1	81.9	56.4	60.6	72.8

TEST NO. 23

Purpose:	To float a chromite concentrate from a combined table tail using deionized water.
Procedure:	As indicated below.
Feed:	1.0 kg table tail composite sands
Grind:	See Test 22

Conditions:

Stage	Reagents Added, g/t					Time, minutes		pH
	Fuel Oil Frother	H_2SiF_6	FA3	825	NaOH	Cond.	Froth	
Ro. Cond.	-	2000	500	50	1300	15	-	6.8-3.3 5.5
Rougher 1	*462	-	500	-	-	-	5	5.5
Rougher 2	-	-	-	-	-	-	4	-
1st Cleaner	42	-	50	-	-	1	5	5.4
2nd Cleaner	-	120	-	-	-	1	3	4.0
3rd Cleaner	-	500	-	-	-	1	2	3.0

*stage additions

Stage	Rougher Cond.	Rougher 1	Rougher 2	1st Cl.	2nd Cl.	3rd Cl.
Speed rpm	900	1200	1200	900	900	900
% Solids	50	30	20	10	<10	<10

TEST NO.: 23

FEED: Combined Table Middlings and Tailings from tests 7 - 9

	WEIGHT	WEIGHT %			ASSAY %		% DISTRIBUTION (Ind.)			% DISTRIBUTION (Overall)		
	g	IND.	O'ALL	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe
Cleaner Conc.	39.2	3.99	3.74	7.06	15.0	8.83	6.7	7.3	10.7	4.7	6.0	9.5
3rd Cl. Tail.	51.4	5.23	4.90	7.86	14.3	7.64	9.8	9.1	12.1	6.8	7.4	10.7
2nd Cl. Tail.	47.0	4.78	4.48	8.83	14.1	6.59	10.1	8.2	9.5	7.0	6.7	8.5
1st Cl. Tail.	11.1	1.13	1.06	4.77	8.67	3.46	1.3	1.2	1.2	0.9	1.0	1.0
Ro. Conc. 2	57.4	5.84	5.47	6.76	12.1	5.77	9.4	8.6	10.2	6.5	7.0	9.0
Ro. Tailing	384.7	39.11	36.67	4.75	8.32	3.23	44.4	39.6	38.2	30.7	32.4	34.0
Slimes	392.8	39.93	37.44	1.92	5.37	1.50	18.3	26.1	18.1	12.7	21.4	16.1
Head (calc.)	983.6	100.00	93.75	4.19	8.22	3.30	100.0	100.0	100.0	69.3	81.9	88.8

COMBINED PRODUCTS

	WEIGHT g	WEIGHT % IND.	WEIGHT % O'ALL	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe
2nd Cl. Conc.		9.21	8.64	7.51	14.6	8.15	16.5	16.4	22.7	11.5	13.4	20.2
1st Cl. Conc.		13.99	13.12	7.96	14.4	7.62	26.6	24.6	32.3	18.4	20.1	28.7
Rougher Conc. 1		15.12	14.17	7.75	14.0	7.31	27.9	25.7	33.4	19.3	21.1	29.7
Rougher Conc. 1+2		20.95	19.64	7.46	13.5	6.88	37.3	34.3	43.6	25.9	28.1	38.7
Flot. Feed		60.07	56.31	5.69	10.1	4.50	81.7	73.9	81.9	56.6	60.5	72.7

TEST NO. 24

Purpose: To float a chromite concentrate from a combined table tail using tap water.

Procedure: As indicated below.

Feed: 1.0 kg table tail composite (Tests 7 to 9).

Grind: 2 kg stage ground in rod mill

Conditions:

Stage	Reagents Added, grams/tonne						Time, min.		pH
	Armac C	NaOH	$Al_2(SO_4)_3$	Dowfroth	Armeen L8D	H_2SO_4	Cond.	Froth	
2 kilograms were stage ground to minus 100 mesh = 20 + 15 minute stages.									
Deslime 3 times - dilute to 10 L - condition 2 minutes at 1000 g/t Na_2CO_3 - settle 10 minutes and siphon									
Start	-	-	-	-	-	-	-	-	8.3
Rougher Cond.	-	670*	600	-	-	-	10	-	11.0
Rougher 1	-	-	-	55	374*	-	2	2	11.0
Rougher 2 Cond.	-	450*	600	-	-	-	10	-	11.0
Rougher 2	-	-	-	90	289*	-	1	2	11.0
Rougher 3 Cond.	-	-	-	-	-	2500*	-	-	4.0
Rougher 3 - No Froth Taken			-	-	170*	-	-	-	4.0
Rougher 4 Cond.	-	-	-	-	-	5500*	10	-	7.0
Rougher 4	200	-	-	-	-	-	1	4	2.3
1st Cleaner	17	-	-	-	-	-	1	3	2.3

*stage additions

Stage	Ro 1 Cond	Rougher 1	Ro 2 Cond	Rougher 2	Ro 3 Cond	Ro 4 Cond	1st Cl
Flotation Cell	500 g D-1	500 g D-1	500 g D-1	500 g D-1	500 g D-1	500 g D-1	250g D-
Speed rpm	900	1200	900	1200	900	900	900
% Solids	50	30	30	30	30	30	10

TEST NO.: 246
FEED: Combined Table Middlings and Tailings from tests 7 - 9

	WEIGHT	WEIGHT %		ASSAY %			% DISTRIBUTION (Ind.)			% DISTRIBUTION (Overall)		
	g	IND.	O'ALL	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe
1st Cleaner Conc.	188.7	19.23	18.03	12.40	15.0	5.84	56.2	35.1	33.9	39.0	28.8	30.1
1st Cleaner Tail.	140.3	14.30	13.41	4.36	9.14	4.08	14.7	15.9	17.6	10.2	13.0	15.6
Ro. Conc. 2	30.0	3.06	2.87	3.91	9.40	5.00	2.8	3.5	4.6	2.0	2.9	4.1
Ro. Conc. 1	52.7	5.37	5.04	1.82	7.20	3.68	2.3	4.7	6.0	1.6	3.9	5.3
Rougher Tail.	252.6	25.74	24.13	1.83	6.44	2.92	11.1	20.2	22.7	7.7	16.5	20.2
Slimes	316.9	32.30	30.28	1.69	5.24	1.56	12.9	20.6	15.2	8.9	16.9	13.5
Head (calc.)	981.2	100.00	93.75	4.24	8.22	3.31	100.0	100.0	100.0	69.3	81.9	88.8

COMBINED PRODUCTS

	WEIGHT	WEIGHT %		ASSAY %			% DISTRIBUTION (Ind.)			% DISTRIBUTION (Overall)		
	g	IND.	O'ALL	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe
Ro. Conc. 4		33.53	31.43	8.97	12.5	5.09	70.9	51.0	51.5	49.1	41.8	45.7
Ro. Conc. 1+2		8.43	7.90	2.58	8.00	4.2	5.1	8.2	10.6	3.5	6.7	9.4
Ro. Conc. 1-4		41.96	39.34	7.69	11.6	4.90	76.0	59.2	62.1	52.7	48.5	55.1
Flot. Feed		67.70	63.47	5.46	9.64	4.15	87.1	79.4	84.8	60.4	65.0	75.3

TEST NO. 25

Purpose:	To float a chromite concentrate from a combined table tail using tap water.
Procedure:	As indicated below.
Feed:	1.0 kg table tail composite (Tests 7 to 9)
Grind:	2 kg stage ground in rod mill (2 kg size) to minus 100 mesh (20 + 15 minute stages).

Conditions:

Stage	Reagents Added, g/t						Time, minutes		pH
	Kerosene	H_2SiF_6	825	NaOH	Dowfroth 250	FA3	Cond.	Froth	
Start	-	-	-	-	-	-	-	-	8.3
Rougher Cond	-	2000	500	1780	-	-	15	-	-
Rougher 1	-	25	-	-	-	-	1	5	5.5
Floated									
Ro. Cond 2	5000	75	500	-	-	-	-	-	5.5
No Float									7.5-5.5
Ro. Cond 3	5000	-	150	-	-	-	-	-	5.5
No Float									
Ro. Cond 4	-	-	-	-	-	230	2	4	5.5
Floated									

Stage	Rougher Cond	Rougher	Rougher 1	Rougher 4
Speed rpm	900	1200	1200	1200
% Solids	50	30	20	20

TEST NO.: 25
FEED: Combined Table Middlings and Tailings from tests 7 - 9

	WEIGHT	WEIGHT %		ASSAY %			% DISTRIBUTION (Ind.)			% DISTRIBUTION (Overall)		
	g	IND.	O'ALL	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe
Ro. Conc. 1	55.0	5.58	5.23	3.94	9.94	5.19	5.4	6.8	8.6	3.7	5.6	7.6
Ro. Conc. 4	37.0	3.75	3.52	6.39	8.97	3.47	5.9	4.1	3.9	4.1	3.4	3.4
Ro. Tailing	577.1	58.53	54.87	5.24	9.56	4.18	75.4	68.5	72.6	52.2	56.1	64.5
Slimes	316.9	32.14	30.13	1.69	5.24	1.56	13.3	20.6	14.9	9.2	16.9	13.2
Head (calc.)	986.0	100.00	93.75	4.07	8.17	3.37	100.00	100.00	100.00	69.3	81.9	88.8

COMBINED PRODUCTS

Ro. Conc. 1+4		9.33	8.75	4.9	9.5	4.50	11.3	10.9	12.5	7.8	8.9	11.1
Flot. Feed		67.86	63.62	5.2	9.6	4.22	86.7	79.4	85.1	60.1	65.0	75.6

TEST NO. 26

Purpose:	To float a chromite concentrate from a combined table tail.
Procedure:	As indicated below.
Feed:	1.0 kg Table Tail composite (Tests 7 to 9).
Grind:	2.0 kg stage ground in rod mill sized and split into two charges.

Conditions:

Stage	Reagents Added, g/t		Time, minutes		pH
	Armac C	H_2SO_4	Cond.	Froth	
Grind	20 + 15 minute stage grind, split into 2 1-kg charges.				
Deslime 3 times	- dilute to 10 L - condition 2 minutes at 1000 g/t Na_2CO_3 - settle 10 minutes and siphon.				
Start	-	-	-	-	8.8
Rougher Cond.	-	10000	10	-	2.3
Rougher	200	-	1	4	2.3
1st Cleaner	20	1100	1	4	2.3
2nd Cleaner	10	500	1	4	2.3
3rd Cleaner	5	400	1	3	2.3

Stage	Rougher Cond	Rougher	1st Cl	2nd Cl	3rd Cl
Flotation Cell	500 g D-1	500 g D-1	250 g D-1	250 g D-1	250 g D-1
Speed rpm	1200	1200	900	900	900
% Solids	50	33	<10	<10	<10

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TEST NO.: 26

FEED: Combined Table Middlings and Tailings from tests 7 - 9

	WEIGHT	WEIGHT %		ASSAY %			% DISTRIBUTION (Ind.)			% DISTRIBUTION (Overall)		
	g	IND.	O'ALL	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe
Cleaner Conc.	164.1	16.81	15.76	17.2	18.0	6.52	67.9	37.5	34.5	47.1	30.7	30.7
3rd Cl. Tail.	22.0	2.25	2.11	7.47	13.6	6.81	4.0	3.8	4.8	2.7	3.1	4.3
2nd Cl. Tail.	23.2	2.38	2.23	4.31	10.9	5.78	2.4	3.2	4.3	1.7	2.6	3.8
1st Cl. Tail.	48.0	4.92	4.61	2.35	8.41	4.38	2.7	5.1	6.8	1.9	4.2	6.0
Rougher Tail.	397.2	40.68	38.14	1.06	5.77	2.69	10.1	29.1	34.5	7.0	23.8	30.6
Slimes	321.9	32.97	30.91	1.66	5.22	1.45	12.9	21.3	15.1	8.9	17.5	13.4
Head (calc.)	976.4	100.0	93.75	4.26	8.07	3.17	100.0	100.0	100.0	69.3	81.9	88.8

COMBINED PRODUCTS

2nd Cl. Conc.		19.06	17.87	16.0	17.5	6.55	71.9	41.3	39.4	49.8	33.8	34.9
1st Cl. Conc.		21.44	20.10	14.7	16.8	6.47	74.3	44.5	43.7	51.5	36.4	38.8
Rougher Conc.		26.35	24.70	12.4	15.2	6.08	77.0	49.6	50.5	53.4	40.6	44.8
Flot. Feed		67.03	62.84	5.5	9.5	4.02	87.1	78.7	84.9	60.4	64.4	75.4

TEST NO. 27

Purpose:	To float a chromite concentrate from a combined Table Tail using tap water. Sample from Test 20 not deslimed.
Procedure:	As indicated below.
Feed:	0.5 kg Table Tail Composite (Tests 7 to 9).
Grind:	2.0 kg stage ground in rod mill, sized and split into two charges.

Conditions:

Stage	Reagents Added, g/t		Time, minutes		pH
	Armac C	H_2SO_4	Cond.	Froth	
See Test 20 for grind information.					
Start (not deslimed)	-	-	-	-	7.6
Rougher Condition	-	16000	10	-	2.3
Rougher	400	-	1	4	2.3

Rougher concentrate full of slime

Stage	Rougher Cond.	Rougher
Flotation Cell	500 g D-1	500 g D-1
Speed rpm	900	1200
% Solids	50	33

TEST NO.: 27
FEED: Combined Table Middlings and Tailings from tests 7 - 9

PRODUCT	WEIGHT	WEIGHT %		ASSAY %			% DISTRIBUTION (Ind.)			% DISTRIBUTION (Overall)		
	g	IND.	O'ALL	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe
Rougher Conc.	154.5	32.57	30.54	4.18	7.71	2.69	32.1	30.0	25.6	22.3	24.5	22.8
Rougher Tailing	319.8	67.43	63.21	4.27	8.71	3.77	67.9	70.0	74.4	47.0	57.4	66.0
Head (calc.)	474.3	100.00	93.75	4.24	8.38	3.42	100.00	100.00	100.00	69.3	81.9	88.8

TEST NO. 28

Purpose:	To float a chromite concentrate from a combined Table Tail
Procedure:	As indicated below.
Feed:	1.0 kg Table Tail composite (Tests 7 to 9)
Grind:	2 kg stage ground in rod mill, sized and split into two charges.

Conditions:

Stage	Reagents Added, g/t		Time, minutes		pH
	Armac C	H_2SO_4	Cond.	Froth	
Test using deslimed sands from Test 26.					
Start	-	-	-	-	8.0
Rougher Condition	-	10000	10	-	2.3
Rougher	300	-	1	4	2.3-3.5
1st Cleaner	40	1000	1	4	2.3-2.5
2nd Cleaner	10	250	1	3	2.3
3rd Cleaner	5	750	1	2	2.3

Stage	Ro Cond	Rougher	1st Cl	2nd Cl	3rd Cl
Flotation Cell	500 g D-1	500 g D-1	250 g D-1	250 g D-1	250 g D-1
Speed rpm	1200	1200	900	900	900
% Solids	50	33	<10	<10	<10

TEST NO.: 28

FEED: Combined Table Middlings and Tailings from tests 7 - 9

	WEIGHT	WEIGHT %		ASSAY %			% DISTRIBUTION (Ind.)			% DISTRIBUTION (Overall)		
	g	IND.	O'ALL	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe
Cleaner Conc.	51.5	5.25	4.92	10.7	9.41	1.5	13.0	6.0	2.5	9.0	4.9	2.2
3rd Cl. Tail.	7.6	0.77	0.73	28.5	20.5	2.74	5.1	1.9	0.7	3.5	1.6	0.6
2nd Cl. Tail.	7.2	0.73	0.69	21.0	18.8	4.91	3.6	1.7	1.1	2.5	1.4	1.0
1st Cl. Tail.	24.0	2.44	2.29	15.5	18.5	7.24	8.8	5.5	5.5	6.1	4.5	4.9
Rougher Tail.	569.6	58.02	54.39	4.25	9.12	4.15	57.0	64.2	75.3	39.5	52.6	66.9
Slimes	321.9	32.79	30.74	1.66	5.22	1.45	12.6	20.8	14.9	8.7	17.0	13.2
Head (calc.)	981.8	100.0	93.75	4.32	8.24	3.20	100.0	100.0	100.0	69.3	81.9	88.8
COMBINED PRODUCTS												
2nd Cl. Conc.		6.02	5.64	13.0	10.8	1.67	18.1	7.9	3.1	12.5	6.5	2.8
1st Cl. Conc.		6.75	6.33	13.9	11.7	2.02	21.6	9.6	4.3	15.0	7.8	3.8
Rougher Conc.		9.20	8.62	14.3	13.5	3.41	30.4	15.1	9.8	21.1	12.3	8.7
Flot. Feed		67.21	63.01	5.6	9.7	4.05	87.4	79.2	85.1	60.6	64.9	75.6

TEST NO. 29

Purpose:	To separate magnetic ore from non-magnetics ore using a Sala Mortzell dry magnetic separator.
Feed Preparation:	The ore was stage crushed and sized to +35 mesh using conventional jaw and cone crushers in the sample preparation plant.
Procedure:	The sample was passed through a Sala Mortzell dry magnetic separator at 150 rpm. The non-magnetics were passed a second and third time at 100 rpm and 75 rpm. The mags and non-mags were assayed for Cr_2O_3, Magnetic Fe and Total Fe.

TEST NO. : 29

SAMPLE NO. : OS2 ACCEPT COMPOSITE
SIZE FRACTION : minus 1/2 inch

PRODUCT	WEIGHT kg	WEIGHT % IND.	WEIGHT % O'ALL	ASSAY % Cr203	ASSAY % Fe	ASSAY % Mag Fe	% DISTRIBUTION (Ind.) Cr203	% DISTRIBUTION (Ind.) Fe	% DISTRIBUTION (Ind.) Mag Fe	% DISTRIBUTION (Overall) Cr203	% DISTRIBUTION (Overall) Fe	% DISTRIBUTION (Overall) Mag Fe
150 rpm Magnetics	2.67	5.5	3.2	3.48	14.1	8.93	1.6	7.3	22.0	1.4	4.5	8.4
100 rpm Magnetics	4.63	9.5	5.6	3.94	10.1	4.89	3.2	9.1	20.8	2.8	5.6	8.0
75 rpm Magnetics	3.05	6.3	3.7	4.39	8.93	3.72	2.3	5.3	10.4	2.1	3.3	4.0
75 rpm Non-Magnetics	32.66	67.2	39.7	13.5	10.2	1.22	76.7	64.7	36.7	67.6	40.0	14.0
Minus 35 mesh	5.63	11.6	6.8	16.5	12.5	1.95	16.2	13.7	10.1	14.2	8.4	3.9
Head (Calc.)	48.63	88.4	59.1	13.36	11.98	2.53	100.0	100.0	100.0	88.1	61.8	38.2
COMBINED PRODUCTS												
150 rpm Non-Magnetics		82.9	49.0	11.7	10.1	1.83	82.2	79.0	67.9	72.4	48.8	26.0
100 rpm Non-Magnetics		73.4	43.4	12.7	10.1	1.43	79.1	70.0	47.1	69.7	43.2	18.0
100 rpm Magnetics		15.0	8.9	3.77	11.6	6.37	4.8	16.4	42.8	4.2	10.1	16.3
75 rpm Magnetics		21.3	12.6	3.95	10.8	5.59	7.1	21.7	53.2	6.3	13.4	20.3

TEST NO. 30

Purpose:	To float a chromite concentrate from a combined Table Tail + Table Middling fraction.
Procedure:	As indicated below.
Feed:	Flotation feed = 1.0 kg of Table Middlings sand
Grind:	2.0 kg stage ground in a rod mill sized at 100 % passing 100 mesh.

Conditions:

Stage	Reagents Added, g/t		Time, minutes		pH
	Armac C	H_2SO_4	Cond.	Froth	
Grind	20 + 15 minutes, 2 kg of Table Tail				
Tabling	-100 mesh tabled on Wilfley table to form concentrate and throw away tail.				
Start					8.9
Rougher Condition	-	5800	10	-	2.3
Rougher	200	-	1	4	2.3-3.0
1st Cleaner	20	2000	-	3	2.3-2.7
2nd Cleaner	10	2000	-	2	2.3
3rd Cleaner	5	3000	-	1	2.3

Stage	Ro Cond	Rougher	1st Cl	2nd Cl	3rd Cl
Flotation Cell	500 g D-1	500 g D-1	250 g D-1	250 g D-1	250 g D-1
Speed rpm	1200	1200	900	900	900
% Solids	50	33	<10	<10	<10

TEST NO.: 30

FEED: Combined Table Middlings and Tailings from tests 7 - 9

	WEIGHT	WEIGHT %			ASSAY %		% DISTRIBUTION (Ind.)			% DISTRIBUTION (Overall)		
	g	IND.	O'ALL	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe
1.Table Conc.	31.9	1.64	1.54	29.7	32.0	12.5	11.0	6.1	6.2	7.6	5.0	5.5
2.Cleaner Conc.	92.1	4.75	4.45	26.5	24.0	7.75	28.3	13.2	11.1	19.6	10.9	9.8
3.3rd Cl. Tail.	60.3	3.11	2.91	18.4	20.0	7.90	12.9	7.2	7.4	8.9	5.9	6.6
4.2nd Cl. Tail.	47.8	2.46	2.31	8.86	13.4	6.11	4.9	3.8	4.5	3.4	3.1	4.0
5.1st Cl. Tail.	64.0	3.30	3.09	2.01	6.81	3.06	1.5	2.6	3.0	1.0	2.1	2.7
6.Rougher Tail.	288.8	14.88	13.95	0.89	5.21	2.15	3.0	9.0	9.6	2.1	7.4	8.5
7.Table Tail.	1355.6	69.86	65.49	2.45	7.13	2.77	38.5	57.9	58.2	26.7	47.4	51.7
Head (calc.)	1940.5	100.00	93.75	4.45	8.60	3.33	100.0	100.0	100.0	69.3	81.9	88.8
COMBINED PRODUCTS												
Comb. Table + Cl. Concs.(1+2)		6.39	5.99	27.3	26.1	8.97	39.3	19.4	17.2	27.2	15.9	15.3
2nd Cl. Conc.(2+3)		7.85	7.36	23.3	22.4	7.81	41.1	20.5	18.4	28.5	16.8	16.4
1st Cl. Conc.(2-4)		10.32	9.67	19.8	20.3	7.40	46.1	24.3	23.0	31.9	19.9	20.4
Rougher Conc.(2-5)		13.62	12.76	15.5	17.0	6.35	47.5	26.9	26.0	32.9	22.1	23.1
Flotation Feed(2-6)		28.50	26.72	7.88	10.8	4.16	50.5	35.9	35.6	35.0	29.4	31.6
Comb. Table + Ro. Tails.(6+7)		84.74	79.44	2.18	6.79	2.66	41.5	67.0	67.8	28.7	54.8	60.2

TEST NO. 31

Purpose: To investigate the flotation response of chromite using collector Duomac T/Ethofat.

Procedure: As shown below.

Feed: 1 kg of Table Tail

Grind: 2 kg of Table Tail stage ground 15 + 20 minutes to minus 100 mesh in a lab rod mill.

Conditions:

Stage	Reagents Added, g/t			Time, minutes			pH
	Oxalic Acid	H_2SiF_6	Duomac T/Ethofat	Grind	Cond.	Froth	
Grind	-	-	-	20+15	-	-	-
Deslime 3 x 10 minutes with 1000 g/t Na_2CO_3 in each stage (decantation) split sand into 2 charges.							
Condition 1	600	1000	-	-	10	-	4.5
2	-	-	300	-	-	-	-
Rougher 1	-	-	-	-	-	3	-
2	-	-	100	-	1	2	-
3	-	125	100	-	1	2	4.0
1st Cleaner	150	250	100	-	2	3	4.0
	-	125	50	-	1	2	-
	-	-	25	-	1	2	3.5
2nd Cleaner	150	250	-	-	1	2	3.5
	-	125	25	-	-	-	-

TEST NO.: 31
FEED: Combined Table Middlings and Tailings from tests 7 - 9

	WEIGHT	WEIGHT %		ASSAY %			% DISTRIBUTION (Ind.)			% DISTRIBUTION (Overall)		
	g	IND.	O'ALL	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe
Cleaner Conc.	321.5	33.01	30.95	9.07	13.1	5.93	66.3	52.3	59.5	45.9	42.8	52.8
2nd Cl. Tail.	112.6	11.56	10.84	3.99	7.02	2.48	10.2	9.8	8.7	7.1	8.0	7.7
1st Cl. Tail.	81.9	8.41	7.88	2.02	5.70	2.17	3.8	5.8	5.5	2.6	4.7	4.9
Rougher Tail.	118.7	12.19	11.43	2.18	5.71	2.08	5.9	8.4	7.7	4.1	6.9	6.8
Slimes	339.1	34.82	32.65	1.80	5.64	1.75	13.9	23.7	18.5	9.6	19.4	16.4
Head (calc.)	973.8	100.0	93.75	4.52	8.28	3.29	100.0	100.0	100.0	69.3	81.9	88.8

COMBINED PRODUCTS

1st Cl. Conc.		44.58	41.79	7.75	11.5	5.04	76.5	62.1	68.2	53.0	50.8	60.6
Rougher Conc.		52.99	49.68	6.84	10.6	4.58	80.2	67.9	73.8	55.6	55.6	65.5
Flot. Feed		65.18	61.10	5.97	9.68	4.11	86.1	76.3	81.5	59.7	62.5	72.4

TEST NO. 33

Purpose:	To upgrade the 3rd cleaner concentrate from Test 26 on the Mozley Mineral Separator.
Feed:	The assay reject (101.8 g) of 3rd cleaner concentrate Test 26.
Procedure:	The sample was hand fed to the Mozley Mineral Separator. A water flowrate of 2 L/minute was applied. A visual separation on the washed stream was made after 1 minute.

Test No. 33 - Continued

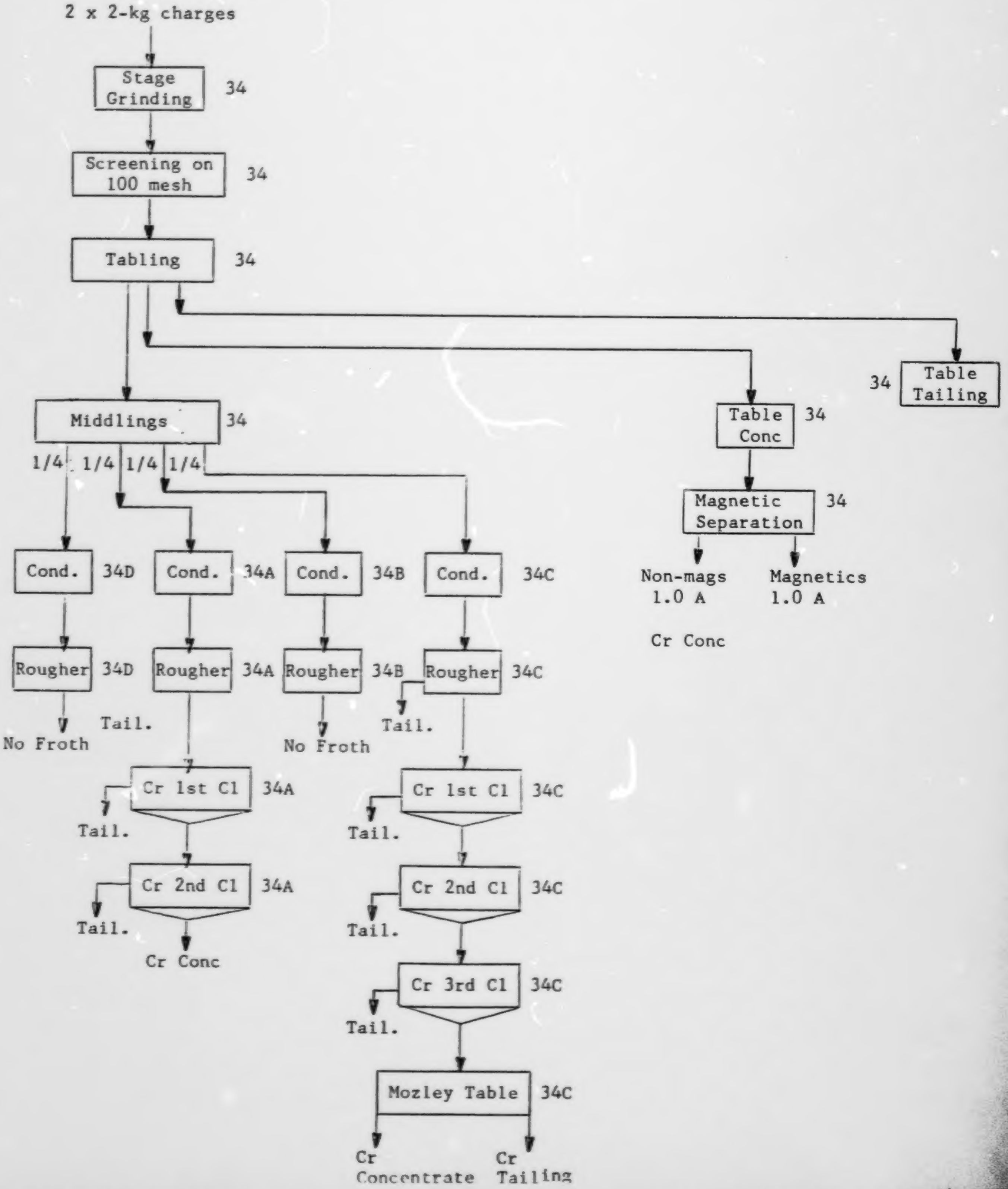
Metallurgical Results

Product	Weight %	Weight O'all	Assays % Cr_2O_3	Assays % Fe	Assays % Mag Fe	% Distribution Individual Cr_2O_3	% Distribution Individual Fe	% Distribution Individual Mag Fe	% Distribution Overall Cr_2O_3	% Distribution Overall Fe	% Distribution Overall Mag Fe
1. Mozley Conc	26.9	4.2	36.5	29.8	7.61	56.3	44.0	33.0	26.5	13.5	10.1
2. Mozley Tail	73.1	11.6	10.3	13.8	5.64	43.7	56.0	67.0	20.6	17.2	20.6
Head (Calc)	100.0	15.8	27.3	28.6	9.74	100.0	100.0	100.0	47.1	30.7	30.7

TEST NO. 34

Purpose:	To investigate the recovery of chromite from the primary gravity separation by regrinding, gravity separation and flotation.
Procedure:	The feed was stage ground to -100 mesh and fed to a Wilfley table. The table concentrate was upgraded by magnetic separation. A large middling product was collected as feed for flotation. The table tailing and slimes were filtered and assayed.
Feed:	4 kg combined table middling and tailing from Tests 7 to 9.
Grind:	Stage ground to -100 mesh.

FLOWSHEET - TESTS 34, 34A, 34B and 34C


2 x 2-kg charges
Stage Grinding
34
Screening on 100 mesh
34
Tabling
34
Middlings
34
Table Conc
34
Table Tailing
34
Magnetic Separation
34
Non-mags 1.0 A
Magnetics 1.0 A
Cr Conc
1/4
1/4
1/4
1/4
Cond.
34D
Cond.
34A
Cond.
34B
Cond.
34C
Rougher
34D
Rougher
34A
Rougher
34B
Rougher
34C
No Froth
Tail.
No Froth
Tail.
Cr 1st Cl
34A
Tail.
Cr 2nd Cl
34A
Tail.
Cr Conc
Cr 1st Cl
34C
Tail.
Cr 2nd Cl
34C
Tail.
Cr 3rd Cl
34C
Tail.
Mozley Table
34C
Cr Concentrate
Cr Tailing

TEST NO. 34A

Purpose:	To float a chromite concentrate from a Table Middlings fraction.
Procedure:	As indicated below.
Feed:	Middlings sands from Test 34
Grind:	See Test 34.

Conditions:

Stage	Reagents Added, grams/tonne					Time, minutes		pH
	HF	Na_2SiF_6	Na Oleate	FA3	Pine Oil	Cond.	Froth	
Start	-	-	-	-	-	-	-	8.2
Rougher Cond	80	-	-	-	-	10	-	5.5
Rougher	-	1000	200	300	14	5	-	5.5
	-	-	-	500	-	5	5	5.5
1st Cleaner	20	-	-	200	14	2	5	4-4.5
2nd Cleaner	30	-	-	100	7	2	5	4.0

Froth looked barren but was pulling chromite. More frother did not help.

Stage	Rougher Cond	Rougher	1st Cleaner	2nd Cleaner
Flotation Cell	500 g D-1	500 g D-1	250 g D-1	250 g D-1
Speed rpm	1200	1200	900	900
% Solids	50	10	10	10

TEST NO.: 34A
FEED: Combined Table Middlings and Tailings from tests 7 - 9

	WEIGHT	WEIGHT %			ASSAY %		% DISTRIBUTION Ind.)			% DISTRIBUTION (Overall)		
	g	IND.	O'ALL	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe
1.1.0 A Non-Mags	28.9	2.98	2.79	40.7	25.1	2.22	26.9	8.8	2.0	18.7	7.2	1.8
2.1.0 A Magnetics	11.1	1.14	1.07	22.1	45.6	28.7	5.6	6.2	10.0	3.9	5.0	8.9
3.2nd Cl. Conc.	14.6	1.51	1.41	29.1	28.1	10.1	9.7	5.0	4.7	6.8	4.1	4.1
4.2nd Cl. Tail.	2.4	0.25	0.23	13.6	20.0	10.0	0.7	0.6	0.8	0.5	0.5	0.7
5.1st Cl. Tail.	2.3	0.24	0.22	2.46	7.59	3.78	0.1	0.2	0.3	0.1	0.2	0.2
6.Rougher Tail.	293.3	30.25	28.36	3.30	7.40	3.16	22.2	26.5	29.3	15.4	21.7	26.0
7.Table Tail.	617.0	63.64	59.66	2.45	6.99	2.72	34.7	52.7	53.0	24.0	43.1	47.1
Head (calc.)	969.5	100.00	93.75	4.50	8.44	3.27	100.0	100.0	100.0	69.3	81.9	88.8

COMBINED PRODUCTS

	IND.	O'ALL	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe
Table Conc.(1+2)	4.12	3.86	35.5	30.8	9.55	32.5	15.0	12.0	22.5	12.3	10.7
Comb. Table + Cl. Conc.(1-3)	5.62	5.27	33.8	30.1	9.70	42.3	20.0	16.7	29.3	16.4	14.8
1st Cl. Conc.(3+4)	1.75	1.64	26.9	27.0	10.1	10.5	5.6	5.4	7.3	4.6	4.8
Rougher Conc.(3-5)	1.99	1.87	24.0	24.6	9.33	10.6	5.8	5.7	7.4	4.8	5.1
Flot. Feed (3-6)	32.24	30.23	4.58	8.46	3.54	32.8	32.3	35.0	22.7	26.5	31.0
Comb. Table + Ro. Tails.(6+7)	93.89	88.03	2.72	7.12	2.86	56.9	79.2	82.3	39.4	64.9	73.1

TEST NO. 34B

Purpose:	To float a chromite concentrate from a Table Tail Table Middling fraction.
Procedure:	As indicated below.
Feed:	Middlings sands from Test 34
Grind:	See Test 34.

Conditions:

Stage	Reagents Added, g/t						Time, minutes		pH
	NaF	SHMP *	FA3	Pine Oil	H_2SO_4	825	Cond.	Froth	
Start (350 g solids)		-	-	-	-	-	-	-	8.3
Rougher Cond	500	500	-	-	250	-	10	-	5.5
Rougher	-	-	200	7	-	-	2	-	5.5
	-	-	200	35	-	-	5	-	-
	-	-	200	-	200	200	5	-	5.5-3.5

* sodium hexametaphosphate

Poor froth.
The products were not analysed.

Stage	Rougher Cond	Rougher
Flotation Cell	500 g D-1	500 g D-1
Speed rpm	1200	1200
% Solids	50	10

TEST NO. 34C

Purpose: To repeat Test 26 and include a straight 1000 g/t addition of hydrofluosilic acid and to obtain higher chromite recovery.

Procedure: As indicated below.

Feed: Middlings Sands from Test 34

Grind: See Test 34.

Conditions:

Stage	Reagents Added, g/t			Time, minutes		pH
	Armac C	H_2SO_4	H_2SiF_6	Cond.	Froth	
Start	-	-	-	-	-	8.1
Rougher Condition	-	3700	1000	10	-	2.2
Rougher	200	-	-	2	5	2.2
1st Cleaner	20	300	-	1	4	3.7-2.2
2nd Cleaner	10	700	-	1	4	3.2-2.2
3rd Cleaner	-	1300	-	1	2	3.2-2.2
4th Cleaner	-	1300	-	1	1	-

4th Cl. Conc + Tail tabled on Mozley Mineral Separator.

Stage	Ro. Cond.	Rougher	1st Cl	2nd Cl	3rd Cl	4th Cl
Flotation Cell	500 g D-1	500g D-1	250 g D-1	250 g D-1	250 g D-1	250g D-1
Speed rpm	1200	1200	900	900	900	900
% Solids	50	30	10	10	10	10

TEST NO.: 34C
FEED: Combined Table Middlings and Tailings from tests 7 - 9

	WEIGHT	WEIGHT %		ASSAY %			% DISTRIBUTION (Ind.)			% DISTRIBUTION (Overall		
	g	IND.	O'ALL	Cr203	Fe	Mag Fe	Cr203	Fe	Mag Fe	Cr203	Fe	Mag F
1 1.0 A Non-Mags	28.9	3.00	2.81	40.7	25.1	2.22	26.9	8.9	2.0	18.6	7.3	1.8
2 1.0 A Magnetics	11.1	1.15	1.08	22.1	45.6	28.7	5.6	6.2	10.0	3.9	5.1	8.9
3 Mozley Conc.	27.1	2.81	2.64	30.6	28.1	9.74	19.0	9.3	8.3	13.2	7.6	7.4
4 Mozley Tail.	80.0	8.31	7.79	4.17	8.57	3.97	7.6	8.4	10.0	5.3	6.9	8.9
5 3rd Cl. Tail.	57.1	5.93	5.56	3.22	7.83	3.56	4.2	5.5	6.4	2.9	4.5	5.7
6 2nd Cl. Tail.	18.9	1.96	1.84	1.44	6.13	2.73	0.6	1.4	1.6	0.4	1.2	1.4
7 1st Cl. Tail.	15.9	1.65	1.55	0.54	5.17	2.32	0.2	1.0	1.2	0.1	0.8	1.0
8 Rougher Tail.	107.0	11.11	10.42	0.53	4.97	2.21	1.3	6.5	7.5	0.9	5.3	6.6
9 Table Tail.	617.0	64.08	60.07	2.45	6.99	2.72	34.6	52.8	53.0	24.0	43.3	47.0
Head (calc.)	962.9	100.00	93.75	4.54	8.48	3.29	100.0	100.0	100.0	69.3	81.9	88.8
COMBINED PRODUCTS												
Table Conc.(1+2)		4.14	3.88	35.5	30.8	9.55	32.5	15.0	12.0	22.5	12.3	10.7
Comb. Table Concs.(1-3)		6.96	6.52	33.5	29.7	9.63	51.4	24.4	20.4	35.6	20.0	18.1
3rd Cl. Conc.(3+4)		11.12	10.43	10.9	13.5	5.43	26.6	17.7	18.4	18.4	14.5	16.3
2nd Cl. Conc.(3-5)		17.05	15.99	8.20	11.5	4.78	30.8	23.2	24.8	21.4	19.0	22.0
1st Cl. Conc.(3-6)		19.02	17.83	7.50	11.0	4.57	31.4	24.6	26.4	21.8	20.2	23.4
Rougher Conc.(3-7)		20.67	19.38	6.95	10.5	4.39	31.6	25.6	27.6	21.9	21.0	24.5
Flot. Feed (3-8)		31.78	29.79	4.70	8.58	3.63	32.9	32.1	35.0	22.8	26.3	31.1
Comb. Table + Ro. Tails.(8+9)		75.19	70.49	2.17	6.69	2.64	35.9	59.3	60.4	24.9	48.6	53.6

TEST NO. 34D

Purpose:	To float a chromite concentrate from a Table Tail Table Middling fraction.
Procedure:	As indicated below.
Feed:	Middling sands were divided into 4 charges (350 g each).

Conditions:

Stage	Reagents Added, g/t					Time, minutes		pH
	SHMP	H_2SO_4	Na Oleate	Pine Oil	FA3	Cond.	Froth	
Start	-	-	-	-	-	-	-	8.2
Rougher Cond.	1000	300	-	-	-	10	-	5-6
Rougher	-	300	500	35	-	5	-	5.6-4.5
	-	200	-	-	300	5	0	5.0

No froth of any amount, totally barren.
Sample not sent in for assay.

Stage	Rougher Condition	Rougher
Flotation Cell	500 g D-1	500 g D-1
Speed rpm	1200	1200
% Solids	50	10

TEST NO. 35

Purpose: To recover a high grade chromium concentrate using tabling and magnetic separation.

Procedure: As indicated below.

Feed: 2 kg minus 10 mesh ore

Grind: Stage ground 20 + 15 minutes in 2 kg rod mill.

Conditions: The ground solids were tabled on a Wilfley table.
Using the Mozley mineral separator the Table Conc was cleaned and then recleaned of magnetics using the Jeffrey Magnetics separator.
The tailings were deslimed 3 times using Na_2CO_3 and combined into two charges for flotation.

TEST NO : 35
FEED : Comb. Table Middlings and Tailings from Tests 7-9

PRODUCT	WEIGHT g	WEIGHT % IND.	 O'ALL	 Cr2O3	ASSAY % Fe	 Mag Fe	% DISTRIBUTION (Ind.) Cr2O3	 Fe	 Mag Fe	% DISTRIBUTION (Overall Cr2O3	 Fe	 Mag F
-100 M Non-Magnetics 1.0A	83.4	4.38	4.11	41.0	25.3	2.72	38.6	13.2	3.5	26.7	10.8	3.1
Magnetics	24.4	1.28	1.20	20.6	46.0	40.4	5.7	7.0	15.4	3.9	5.8	13.7
Mozley Tail A	10.1	0.53	0.50	12.2	16.2	7.06	1.4	1.0	1.1	1.0	0.8	1.0
Table Midds + Tail	1786.6	93.81	87.95	2.70	7.02	2.87	54.4	78.7	80.0	37.7	64.4	71.0
-100 M (calc.)	1904.5	100.00	93.75	4.66	8.37	3.37	100.0	100.0	100.0	69.3	81.9	88.8

COMBINED PRODUCTS

PRODUCT	IND.	O'ALL	Cr2O3	Fe	Mag Fe	Cr2O3	Fe	Mag Fe	Cr2O3	Fe	Mag F
-100 M Mozley Conc.	5.66	5.31	36.4	30.0	11.2	44.2	20.3	18.9	30.6	16.6	15.8
Table Conc.	6.19	5.80	34.3	28.8	10.9	45.6	21.3	20.0	31.6	17.5	17.8

TEST NO. 35A

Purpose: To repeat Test 34C including the straight 1000 g/t addition of Hydrofluosilicic acid and to obtain higher chromite recovery.

Procedure: As indicated below, based on 1 kg feed.

Feed: Midds + deslimed Table Tails (Test 35) combined and split into 2 charges.

Grind: 100 % -100 mesh

Conditions:

Stage	Reagents Added, g/t			Time, minutes		pH
	Armac C	H_2SO_4	H_2SiF_6	Cond.	Froth	
Start	-	-	-	-	-	8.2
Rougher Condition	-	7000	1000	10	-	2.2
Rougher	200	500	-	2	5	2.2-3.7
1st Cleaner	20	700	-	1	4	3.7-2.2
2nd Cleaner	10	600	-	1	4	3.2-2.2
3rd Cleaner	-	400	-	1	2	3.3-2.2

3rd Cleaner Conc treated on Mozley Mineral Separator

Stage	Rougher Cond	Rougher	1st Cleaner	2nd Cleaner	3rd Cleaner
Flotation Cell	500 g D-1	500 g D-1	250 g D-1	250 g D-1	250 g D-1
Speed rpm	1200	1200	1000	1000	1000
% Solids	50	30	10	10	10

TEST NO.: 35A
FEED: Combined Table Middlings and Tailings from tests 7 - 9

	WEIGHT	WEIGHT %		ASSAY %			% DISTRIBUTION (Ind.)			% DISTRIBUTION (Overall)		
	g	IND.	O'ALL	Cr2O3	Fe	Mag Fe	Cr2O3	Fe	Mag Fe	Cr2O3	Fe	Mag Fe
1.1.0 A Non-Mags	41.7	4.40	4.13	41.0	25.3	2.72	37.8	13.2	3.6	26.2	10.8	3.2
2.1.0 A Magnetics	12.2	1.29	1.21	20.6	46.0	40.4	5.6	7.0	15.5	3.9	5.8	13.7
3.Mozley Tail A	5.1	0.53	0.50	12.2	16.2	7.06	1.4	1.0	1.1	0.9	0.8	1.0
4.Mozley Conc.	23.0	2.43	2.28	35.9	26.0	6.15	18.3	7.5	4.4	12.7	6.1	3.9
5.Mozley Tail.	158.9	16.78	15.73	5.38	10.3	5.00	18.9	20.5	24.9	13.1	16.8	22.2
6. 3rd Cl. Tail.	22.0	2.32	2.18	3.44	10.5	5.68	1.7	2.9	3.9	1.2	2.4	3.5
7.2nd Cl. Tail.	17.1	1.81	1.69	2.10	8.45	4.43	0.8	1.8	2.4	0.6	1.5	2.1
8.1st Cl. Tail.	42.8	4.52	4.24	1.51	7.41	3.83	1.4	4.0	5.1	1.0	3.3	4.6
9.Rougher Tail.	363.2	38.36	35.96	0.69	5.96	2.86	5.5	27.2	32.6	3.8	22.3	29.0
10.Slimes	260.8	27.55	25.82	1.50	4.51	0.78	8.7	14.8	6.4	6.0	12.1	5.7
Head (calc.)	946.8	100.00	93.75	4.78	8.41	3.36	100.0	100.0	100.0	69.3	81.9	88.8

COMBINED PRODUCTS

Mozley Conc.(1+2)	5.69	5.34	36.4	30.0	11.25	43.4	20.3	19.0	30.1	16.6	16.9
Table Conc.(1-3)	6.23	5.84	34.3	28.8	10.89	44.7	21.3	20.2	31.0	17.5	17.9
Comb. Table Concs.(1-4)	8.66	8.12	34.8	28.0	9.56	63.0	28.8	24.6	43.7	23.6	21.8
3rd Cl. Conc.(4+5)	19.21	18.01	9.24	12.3	5.15	37.2	28.1	29.4	25.8	23.0	26.1
2nd Cl. Conc.(4-6)	21.54	20.19	8.61	12.1	5.20	38.8	31.0	33.3	26.9	25.3	29.6
1st Cl. Conc.(4-7)	23.34	21.88	8.11	11.8	5.14	39.6	32.8	35.7	27.5	26.8	31.7
Rougher Conc.(4-8)	27.86	26.12	7.04	11.1	4.93	41.1	36.7	40.8	28.5	30.1	36.3
Flot. Feed (4-9)	66.23	62.09	3.36	8.12	3.73	46.6	63.9	73.5	32.3	52.3	65.2
Comb. Ro. Tail+ Slimes(9+10)	65.91	61.79	1.03	5.35	1.99	14.2	41.9	39.0	9.8	34.3	34.6

TEST NO. 35B

Purpose: To repeat Test 34A on a combined table middling and table tail (deslimed)

Procedure: As indicated below, based on 1 kg feed.

Feed: Midd and deslimed Table Tails (Test 35) combined and split into 2 charges.

Grind: 100 % -100 mesh

Conditions:

Stage	Reagents Added, g/t					Time, minutes		pH
	HF	Na_2SiF_6	Na Oleate	FA3	Pine Oil	Cond.	Froth	
Start	-	-	-	-	-	-	-	8.2
Rougher Condition	80	-	-	-	-	10	-	5.5
Rougher	-	1000	200	300	14	5	-	5.5
	-	-	-	500	-	5	5	5.5
1st Cleaner	20	-	-	200	14	2	5	4-4.5
2nd Cleaner	30	-	-	100	7	2	5	4.0

2nd Cleaner treated on Mozley Mineral Separator

Stage	Rougher Cond	Rougher	1st Cleaner	2nd Cleaner
Flotation Cell	500 g D-1	500 g D-1	250 g D-1	250 g D-1
Speed rpm	1200	1200	900	900
% Solids	50	30	10	10

TEST NO.: 35B
FEED: Combined Table Middlings and Tailings from tests 7 - 9

	WEIGHT	WEIGHT %		ASSAY %			% DISTRIBUTION (Ind.)			% DISTRIBUTION (Overall)		
	g	IND.	O'ALL	Cr2O3	Fe	Mag Fe	Cr2O3	Fe	Mag Fe	Cr2O3	Fe	Mag Fe
1.1.0 A Non-Mags	41.7	4.35	4.08	41.0	25.3	2.72	39.2	13.2	3.5	27.2	10.8	3.1
2.1.0 A Magnetics	12.2	1.27	1.19	20.6	46.0	40.4	5.8	7.0	15.2	4.0	5.8	13.5
3.Mozley Tail A	5.1	0.53	0.50	12.2	16.2	7.06	1.4	1.0	1.1	1.0	0.8	1.0
4.Mozley Conc.	4.9	0.51	0.48	25.4	31.3	15.5	2.9	1.9	2.3	2.0	1.6	2.1
5.Mozley Tail.	80.6	8.42	7.89	4.61	11.1	6.07	8.5	11.2	15.1	5.9	9.2	13.4
6.2nd Cl. Tail.	72.5	7.57	7.10	1.63	7.07	3.56	2.7	6.4	8.0	1.9	5.3	7.1
7.1st Cl. Tail.	19.2	2.00	1.88	3.18	11.1	6.39	1.4	2.7	3.8	1.0	2.2	3.4
8 Rougher Tail.	460.8	48.11	45.11	2.75	7.21	3.13	29.1	41.7	44.6	20.2	34.1	39.6
9.Slimes	260.8	27.23	25.53	1.50	4.51	0.78	9.0	14.8	6.3	6.2	12.1	5.6
Head (calc.)	957.8	100.00	93.75	4.55	8.32	3.38	100.0	100.0	100.0	69.3	81.9	88.8

COMBINED PRODUCTS

Mozley Conc.(1+2)	5.63	5.28	36.4	30.0	11.2	45.0	20.3	18.7	31.2	16.6	16.6
Table Conc.(1-3)	6.16	5.77	34.3	28.8	10.9	46.4	21.3	19.9	32.2	17.4	17.6
Comb. Table Concs.(1-4)	6.67	6.25	33.6	29.0	11.2	49.3	23.2	22.2	34.2	19.0	19.7
2nd Cl. Conc.(4+5)	8.93	8.37	5.80	12.3	6.61	11.4	13.1	17.5	7.9	10.8	15.5
1st Cl. Conc.(4-6)	16.50	15.47	3.89	9.88	5.21	14.1	19.6	25.5	9.8	16.0	22.6
Rougher Conc.(4-7)	18.50	17.35	3.81	10.0	5.34	15.5	22.3	29.3	10.7	18.2	26.0
Flot. Feed (4-8)	66.61	62.45	3.04	7.99	3.74	44.6	63.9	73.9	30.9	52.4	65.6
Comb Ro. Tail+ Slimes(8+9)	75.34	70.63	2.30	6.23	2.28	38.1	56.4	50.9	26.4	46.2	45.2

TEST NO. 36

Purpose:	To repeat Test 35.
Procedure:	As outlined below.
Feed:	2 kg charge of minus 10 mesh composite from Tests 7,8 and 9 Tails + Midds.
Grind:	Stage ground in a small rod mill.
Conditions:	Ground for 20 + 15 minutes in small rod mill. Sized on 100 mesh to 100 % minus 100 mesh. Tabled the slurry to form a Table Conc, Midds and Tails sample. The table conc was treated on the Mozley Mineral Separator to produce a cleaned Table Conc followed by magnetic separation. The tail was deslimed 3 times with 1000 g/t Na_2CO_3. The deslimed tail, midds and Mozley Table Tail were combined to form two separate charges for flotation.

TEST NO : 36
FEED : Comb. Table Middlings and Tailings from Tests 7-9

PRODUCT	WEIGHT g	WEIGHT % IND.	O'ALL	ASSAY % Cr2O3	Fe	Mag Fe	% DISTRIBUTION (Ind.) Cr2O3	Fe	Mag Fe	% DISTRIBUTION (Overal Cr2O3	Fe	Mag F
-100 M 2.0 A Non-Mags	73.5	3.95	3.70	39.2	23.6	1.50	34.4	10.9	1.7	23.8	8.9	1.5
2.0 A Magnetics	3.9	0.21	0.20	27.2	38.9	17.9	1.3	0.9	1.1	0.9	0.8	1.0
1.0 A Magnetics	31.4	1.69	1.58	20.3	45.4	29.5	7.6	8.9	14.3	5.3	7.3	12.7
Table Midds + Tail	1752.2	94.15	88.27	2.71	7.23	3.06	56.7	79.3	82.9	39.3	64.9	73.6
-100 M (calc.)	1861.0	100.00	93.75	4.50	8.59	3.48	100.0	100.0	100.0	69.3	81.9	88.8

COMBINED PRODUCTS

-100 M 1.0 A Non-Mags		4.16	3.90	38.6	24.4	2.3	35.7	11.8	2.8	24.7	9.7	2.5
Table Conc.		5.85	5.48	33.3	30.4	10.2	43.3	20.7	17.1	30.0	17.0	15.2

TEST NO. 36B

Purpose:	To repeat 36A but raise the pH levels to reduce acid consumption.
Procedure:	As outlined below.
Feed:	Midds and deslimed Table Tails (Test 36) combined and split into 2 charges.
Grind:	100 % -100 mesh

Conditions:

Stage	Reagents Added, g/t		Time, minutes		pH
	Armac C	H_2SO_4	Cond.	Froth	
Start	-	-	-	-	8.6
Rougher Condition	-	4200	10	-	4.0
Rougher	200	500	2	5	4.0
1st Cleaner	20	500	2	4	3.0
2nd Cleaner	10	800	2	4	2.5
3rd Cleaner	-	600	1	2	2.5

3rd Cleaner treated on Mozley Mineral Separator.

Stage	Rougher Cond	Rougher	1st Cleaner	2nd Cleaner	3rd Cleaner
Flotation Cell	500 g D-1	500 g D-1	250 g D-1	250 g D-1	250 g D-1
Speed rpm	1200	1200	1000	1000	1000
% Solids	50	30	10	10	10

TEST NO.: 36A
FEED: Combined Table Middlings and Tailings from tests 7 - 9

	WEIGHT	WEIGHT %		ASSAY %			% DISTRIBUTION (Ind.)			% DISTRIBUTION (Overall)		
	g	IND.	O'ALL	Cr2O3	Fe	Mag Fe	Cr2O3	Fe	Mag Fe	Cr2O3	Fe	Mag Fe
1.2.0 A Non-Mags	36.8	3.99	3.75	39.2	23.6	1.5	34.4	11.0	1.7	23.8	9.0	1.5
2.2.0 A Magnetics	2.0	0.22	0.20	27.2	38.9	17.9	1.3	1.0	1.1	0.9	0.8	1.0
3.1.0 A Magnetics	15.7	1.70	1.50	20.3	45.4	29.5	7.6	9.0	14.6	5.3	7.4	13.0
4.Mozley Conc.	13.0	1.41	1.32	33.9	28.1	7.75	10.5	4.6	3.2	7.3	3.8	2.8
5.Mozley Tail.	105.5	11.45	10.74	8.31	13.2	6.04	22.1	17.6	20.1	15.3	14.4	17.8
6.3rd Cl. Tail.	31.3	3.40	3.19	5.92	13.9	7.57	4.4	5.5	7.5	3.1	4.5	6.6
7.2nd Cl. Tail.	22.1	2.40	2.25	3.00	10.70	5.95	1.6	3.0	4.1	1.1	2.4	3.7
8.1st Cl. Tail.	45.7	4.96	4.65	1.51	8.46	4.46	1.6	4.9	6.4	1.1	4.0	5.7
9.Rougher Tail.	364.1	39.52	37.05	0.68	5.76	2.7	5.9	26.5	31.0	4.1	21.7	27.5
10 Slimes	285.0	30.94	29.00	1.56	4.72	1.14	10.6	17.0	10.2	7.3	13.9	9.1
Head (calc.)	921.2	100.00	93.75	4.56	8.59	3.44	100.0	100.0	100.0	69.3	81.9	88.8

COMBINED PRODUCTS

1.0 A Non-Mags (1+2)		4.21	3.95	38.6	24.4	2.35	35.7	12.0	2.9	24.7	9.8	2.5
Table Conc.(1-3)		5.92	5.55	33.3	30.4	10.17	43.2	21.0	17.5	30.0	17.2	15.5
Comb. Table Concs.(1-4)		7.33	6.87	33.4	30.0	9.70	53.7	25.6	20.6	37.2	20.9	18.3
3rd Cl. Conc.(4+5)		12.86	12.06	11.56	14.8	6.23	32.6	22.2	23.3	22.6	18.2	20.7
2nd Cl. Conc.(4-6)		16.26	15.25	10.38	14.6	6.51	37.0	27.7	30.7	25.7	22.7	27.3
1st Cl. Conc.(4-7)		18.66	17.49	9.43	14.1	6.44	38.6	30.7	34.9	26.8	25.1	31.0
Rougher Conc.(4-8)		23.62	22.15	7.77	12.9	6.02	40.3	35.6	41.3	27.9	29.1	36.7
Flot. Feed (4-9)		63.15	59.20	3.33	8.45	3.94	46.2	62.1	72.3	32.0	50.8	64.2
Comb.Ro.Tail.+ Slimes(9+10)		70.46	66.06	1.07	5.30	2.02	16.5	43.5	41.2	11.4	35.6	36.6

TEST NO.: 36B
FEED: Combined Table Middlings and Tailings from tests 7 - 9

	WEIGHT	WEIGHT %		ASSAY %			% DISTRIBUTION (Ind.)			% DISTRIBUTION (Overall)		
	g	IND.	O'ALL	Cr_2O_3	Fe	Mag Fe	Cr_2O_3	Fe	Mag Fe	Cr_2O_3	Fe	Mag Fe
1.2.0 A Non-Mags	36.8	3.91	3.67	39.2	23.6	1.5	34.5	10.8	1.7	23.9	8.8	1.5
2.2.0 A Magnetics	2.0	0.21	0.20	27.2	38.9	17.9	1.3	1.0	1.1	0.9	0.8	1.0
3.1.0 A Magnetics	15.7	1.67	1.57	20.3	45.4	29.5	7.6	8.8	14.0	5.3	7.2	12.4
4.Mozley Conc.	5.2	0.55	0.52	32.7	26.9	7.07	4.1	1.7	1.1	2.8	1.4	1.0
5.Mozley Tail.	151.4	16.11	15.10	5.82	10.3	4.47	21.1	19.3	20.5	14.6	15.8	18.2
6.3rd Cl. Tail.	39.1	4.16	3.90	2.55	9.09	4.91	2.4	4.4	5.8	1.7	3.6	5.2
7.2nd Cl. Tail.	30.7	3.27	3.06	1.78	7.37	3.82	1.3	2.8	3.5	0.9	2.3	3.1
8.1st Cl. Tail.	85.1	9.05	8.49	2.30	7.77	3.99	4.7	8.2	10.3	3.2	6.7	9.1
9.Rougher Tail.	289.0	30.74	28.82	1.81	7.31	3.69	12.5	26.2	32.2	8.7	21.5	28.6
10.Slimes	285.0	30.32	28.42	1.56	4.72	1.14	10.6	16.7	9.8	7.4	13.7	8.7
Head (calc.)	940.0	100.00	93.75	4.45	8.57	3.52	100.0	100.0	100.0	69.3	81.9	88.8

COMBINED PRODUCTS

	WEIGHT	WEIGHT %		ASSAY %			% DISTRIBUTION (Ind.)			% DISTRIBUTION (Overall)		
	g	IND.	O'ALL	Cr_2O_3	Fe	Mag Fe	Cr_2O_3	Fe	Mag Fe	Cr_2O_3	Fe	Mag Fe
1.0 A Non-Mags (1+2)		4.13	3.87	38.6	24.4	2.35	35.8	11.7	2.8	24.8	9.6	2.4
Table Conc.(1-3)		5.80	5.44	33.3	30.4	10.2	43.4	20.6	16.8	30.1	16.9	14.9
Comb. Table Concs.(1-4)		6.35	5.95	33.3	30.1	9.90	47.5	22.3	17.9	32.9	18.3	15.9
3rd Cl. Conc.(4+5)		16.66	15.62	6.71	10.9	4.56	25.1	21.1	21.6	17.4	17.3	19.2
2nd Cl. Conc.(4-6)		20.82	19.52	5.88	10.5	4.63	27.5	25.5	27.4	19.1	20.9	24.3
1st Cl. Conc.(4-7)		24.09	22.58	5.32	10.1	4.52	28.8	28.3	30.9	20.0	23.2	27.5
Rougher Conc.(4-8)		33.14	31.07	4.50	9.45	4.37	33.5	36.5	41.2	23.2	29.9	36.6
Flot. Feed (4-9)		63.88	59.89	3.20	8.42	4.04	46.0	62.7	73.4	31.9	51.4	65.2
Comb.Ro.Tail.+ Slimes(9+10)		61.06	57.25	1.69	6.02	2.42	23.1	42.9	42.1	16.0	35.1	37.4

Test No. 37

Purpose:	To repeat Test 35B with the substitution of H_2SO_4 for HF and Pamak fatty acid (C-4) for FA3.
Procedure:	As indicated below.
Feed:	Table Tails and Midds Combined -100 mesh
Grind:	100 % minus 100 mesh (1-20 minutes + 1-15 minutes) in rod mill.

Conditions:

Stage	Reagents Added, g/t						Time, minutes		pH
	Na_2CO_3	H_2SO_4	Na_2SiF_6	Na Oleate	Pamak C4	Pine Oil	Cond.	Froth	
Desliming 1	1000 - conditioned 5 minutes						5		
2	1000 - let stand 8 min. siphoned								
3	1000 - off suspended solids in 3 cycles								
The deslimed charge was split to produce approximately 500 g.									
	-	-	-	-	-	-	-	-	8.1
Ro. Cond.	-	120	-	-	-	-	10	-	5.5
Rougher	-	-	1000	200	300	21	5	5	4.7
	-	40	-	-	500	14	5	7	5.3
	-	5	-	-	500	7	-	-	-
1st Cleaner	-	80	-	-	200	-	2	5	4.4
2nd Cleaner	-	40	-	-	100	-	2	5	4.5
3rd Cleaner	-	-	1000	200	100	-	5	7	3.1

3rd Cleaner Conc. to Mozley separator

Stage	Rougher
Flotation Cell	500 g D-1
Speed rpm	1200
% Solids	33

TEST NO : 37T
FEED : Comb. Table Middlings amd Tailings from Tests 7-9

PRODUCT	WEIGHT g	WEIGHT % IND.	O'ALL	Cr2O3	ASSAY % Fe	Mag Fe	% DISTRIBUTION (Ind.) Cr2O3	Fe	Mag Fe	% DISTRIBUTION (O'all) Cr2O3	Fe	Mag Fe
-100 M Non-Magnetics 2.0A	88.0	5.21	4.88	41.7	23.8	1.30	55.4	17.9	1.6	38.4	14.7	1.5
Magnetics 2.0A	6.4	0.38	0.36	26.6	39.7	19.9	2.6	2.2	1.8	1.8	1.8	1.6
Magnetics 1.0A	46.1	2.73	2.56	19.7	45.4	30.7	13.7	17.9	20.4	9.5	14.7	18.1
Table Midds + Tail	1548.7	91.68	85.95	1.21	4.68	3.41	28.3	62.0	76.1	19.6	50.8	67.6
-100 M (calc.)	1689.2	100.00	93.75	3.92	6.92	4.11	100.0	100.0	100.0	69.3	81.9	88.8
COMBINED PRODUCTS												
-100 M Non-Magnetics 1.0A		5.59	5.24	40.7	24.9	2.56	58.0	20.1	3.5	40.2	16.5	3.1
Table Conc.		8.32	7.80	33.8	31.6	11.8	71.7	38.0	23.9	49.7	31.1	21.2

TEST NO.: 37
FEED: Combined Table Middlings and Tailings from tests 7 - 9

	WEIGHT	WEIGHT %		ASSAY %			% DISTRIBUTION (Ind.)			% DISTRIBUTION (Overall)		
	g	IND.	O'ALL	Cr2O3	Fe	Mag Fe	Cr2O3	Fe	Mag Fe	Cr2O3	Fe	Mag Fe
1.2.0 A Non-Mags	44.0	5.21	4.88	41.7	23.8	1.30	47.6	14.7	2.0	33.0	12.0	1.8
2.2.0 A Magnetics	3.2	0.38	0.36	26.6	39.7	19.9	2.2	1.8	2.2	1.5	1.5	2.0
3.1.0 A Magnetics	23.0	2.72	2.55	19.7	45.4	30.7	11.7	14.6	24.9	8.1	12.0	22.1
4.Mozley Conc.	16.2	1.92	1.80	12.4	23.7	14.1	5.2	5.4	8.1	3.6	4.4	7.2
5.Mozley Tail.	103.2	12.22	11.46	5.18	13.1	7.24	13.9	19.0	26.4	9.6	15.5	23.4
6.3rd Cl. Tail.	116.7	13.82	12.95	0.56	4.90	2.11	1.7	8.0	8.7	1.2	6.6	7.7
7.2nd Cl. Tail.	11.6	1.37	1.29	1.96	8.66	4.65	0.6	1.4	1.9	0.4	1.2	1.7
8.1st Cl. Tail.	100.1	11.85	11.11	1.01	5.11	2.06	2.6	7.2	7.3	1.8	5.9	6.5
9.Rougher Tail.	166.9	19.76	18.53	1.08	4.60	1.65	4.7	10.8	9.7	3.2	8.8	8.6
10.Slimes	259.7	30.75	28.83	1.46	4.72	0.96	9.8	17.2	8.8	6.8	14.1	7.8
Head (calc.)	844.6	100.00	93.75	4.57	8.44	3.36	100.0	100.0	100.0	69.3	81.9	88.8

COMBINED PRODUCTS

1.0 A Non-Mags (1+2)		5.59	5.24	40.7	24.9	2.56	49.8	16.5	4.3	34.5	13.5	3.8
Table Conc.(1-3)		8.31	7.79	33.8	31.6	11.8	61.5	31.1	29.2	42.6	25.5	25.9
Comb. Table Concs.(1-4)		10.23	9.59	29.8	30.1	12.2	66.7	36.5	37.2	46.2	29.9	33.1
3rd Cl. Conc.(4+5)		14.14	13.25	6.16	14.5	8.17	19.1	24.3	34.4	13.2	19.9	30.6
2nd Cl. Conc.(4-6)		27.95	26.21	3.39	9.77	5.18	20.8	32.4	43.1	14.4	26.5	38.3
1st Cl. Conc.(4-7)		29.33	27.49	3.32	9.72	5.15	21.4	33.8	45.0	14.8	27.7	40.0
Rougher Conc.(4-8)		41.18	38.61	2.66	8.39	4.26	24.0	40.9	52.3	16.6	33.5	46.4
Flot. Feed (4-9)		60.94	57.13	2.15	7.16	3.41	28.6	51.7	62.0	19.9	42.3	55.1
Comb.Ro.Tail.+ Slimes(9+10)		50.51	47.35	1.31	4.67	1.23	14.5	28.0	18.5	10.1	22.9	16.4

Test No. 38

Purpose: To perform a gravity concentration on a slime product.

Feed: 50 gram slime sample from test No. 11.

Procedure: A 50 gram sample from the slime product of test No. 11 was tabled on the Mozely flat table. The Mozley concentrate and tailings were assayed.

Metallurgical Results

Product	Weight	Assays, %		% Distribution		
	%	Cr_2O_3	Fe	Cr_2O_3		Fe
				Ind.	O'all	
Slimes Mozely Conc.	6.50	6.61	11.2	21.9	2.2	12.8
Slimes Mozley Tail.	93.50	1.64	5.32	78.1	7.8	87.2
Head (Calculated)	100.00	1.96	5.70	100.0	10.0	100.0

Test No. PP-1

WHOLE ORE

1. Purpose: A preliminary test to set-up and operate the primary grinding and gravity separation circuit.

2. Method: Minus 7 mm ore was fed to a 405 x 815 Denver rod mill loaded with 216 kg rods. The mill discharge was pumped to a 24 mesh screen with the screen oversize being returned to the mill. The minus 24 mesh product was pumped to a Vickers FGL MK6 spiral. A middling product was recirculated. The spiral concentrate was cleaned on Wilfley Model 13b table. A middling product was recirculated round the table and the table tailing was recirculated to the spiral feed.

   The circuit was operated for 3 hours and the circuit products were sampled every 5 minutes during the last 20 minutes of operation.

3. Results: High circulating load appeared to be building around the table and stable conditions may not have been obtained.

3.1. Metallurgical Results

Product	Weight %	Assays %			% Distribution		
		Cr_2O_3	Fe	Mag Fe	Cr_2O_3	Fe	Mag Fe
Table Concentrate	14.1	34.4	29.9	8.46	61.9	38.9	30.2
Spiral Tailing	85.9	3.49	7.72	3.22	38.1	61.1	69.8
Minus 24 Mesh (Calc.)	100.0	7.86	10.9	3.96	100.0	100.0	100.0
(Direct)	-	7.86	10.6	3.95	-	-	-

3.2. Size Analyses:

Spiral Tail

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 28	1.2	1.2	98.8
35	7.6	8.8	91.2
48	13.3	22.1	77.9
65	12.0	34.1	65.9
100	10.1	44.2	55.8
150	7.9	52.1	47.9
200	5.8	57.9	42.1
270	4.7	62.6	37.4
400	1.2	63.8	36.2
- 400	36.2	100.0	-
Total	100.0	-	-

Test No. PP-1 - Continued

3.2. Size Analyses - Cont'd

Minus 20 Mesh

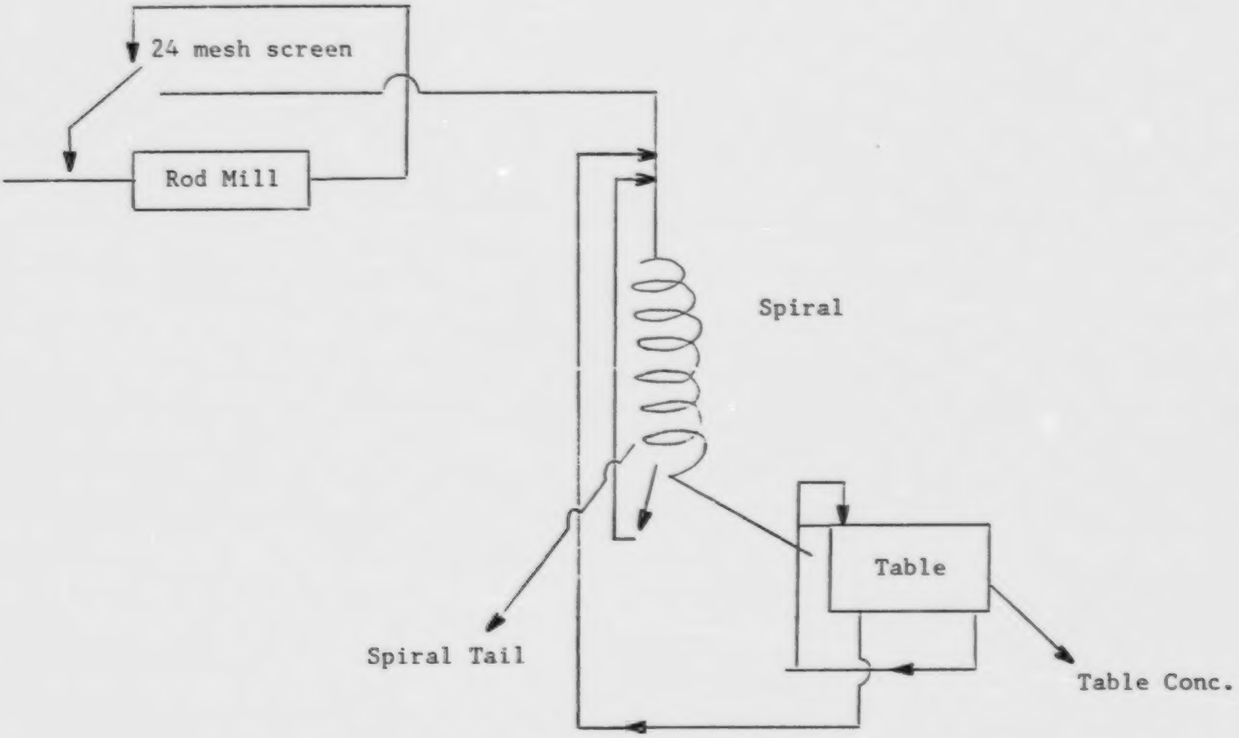
Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 28	0.8	0.8	99.2
35	7.2	8.0	92.0
48	14.3	22.3	77.7
65	14.3	36.6	63.4
100	12.2	48.8	51.2
150	9.7	58.5	41.5
200	6.8	65.3	34.7
270	4.9	70.2	29.8
400	1.9	72.1	27.9
- 400	27.9	100.0	-
Total	100.0	-	-

Table Concentrate

+ 35	0.4	0.4	99.6
48	5.3	5.7	94.3
65	13.5	19.2	80.8
100	20.9	40.1	59.9
150	22.2	62.3	37.7
200	18.2	80.5	19.5
270	11.7	92.2	7.8
400	0.9	93.1	6.9
- 400	6.9	100.0	-
Total	100.0	-	-

Test No. PP-1 - Continued

4. Flowsheet:


24 mesh screen
Rod Mill
Spiral
Spiral Tail
Table
Table Conc.

Test No. PP-2 **WHOLE ORE**

1. Purpose: To add on the secondary grinding and gravity separation circuits.

2. Method: The primary grinding circuit was operated as in Test PP-1. The spiral tailing was reground in a 405 x 815 mm Denver ball mill operated in closed circuit with a 1520 x 205 mm Dorr double rake classifier. The classifier overflow was fed to a 2740 x 1220 mm Wilfley Model 21 table. A middling product was recirculated on the table.

The circuit was operated at a feed rate of 100 kg/h for 4 hours and the circuit products were sampled during the last hour of operation.

3. Results: High circulating load developed around the ball mill during the latter part of the run.

3.1. Pulp Densities		% Solids
Rod Mill Discharge	1775	66
Spiral Tailing	1185	24
Ball Mill Discharge	1735	64
Rake Overflow	1160	21

3.2. Metallurgical Results

Product	Weight %	Assays %			% Distribution			Ratio Cr:Fe
		Cr_2O_3	Fe	Mag Fe	Cr_2O_3	Fe	Mag Fe	
Table 1 Concentrate	3.6	38.0	28.0	6.72	20.0	10.5	6.8	0.93
Spiral Tailing	96.4	5.72	8.94	3.45	80.0	89.5	93.2	
Minus 24 Mesh (Calc.)	100.0	6.89	9.63	3.57	100.0	100.0	100.0	
(Direct)	-	6.89	9.83	3.72	-	-	-	
Table 2 Concentrate	13.0	24.4	26.3	11.6	46.0	33.8	36.9	0.63
Table 2 Tailing	83.4	2.81	6.76	2.76	34.0	55.7	56.3	
Sprital Tail (Calc.)	96.4	5.72	9.39	3.95	80.0	89.5	93.2	
(Direct)	-	5.72	8.94	3.45	-	-	-	
Combined Table Conc.	16.6	27.4	26.7	10.5	66.0	44.3	43.7	0.70

Test No. PP-2 - Continued

3.3. Size Analyses:

Screen Undersize

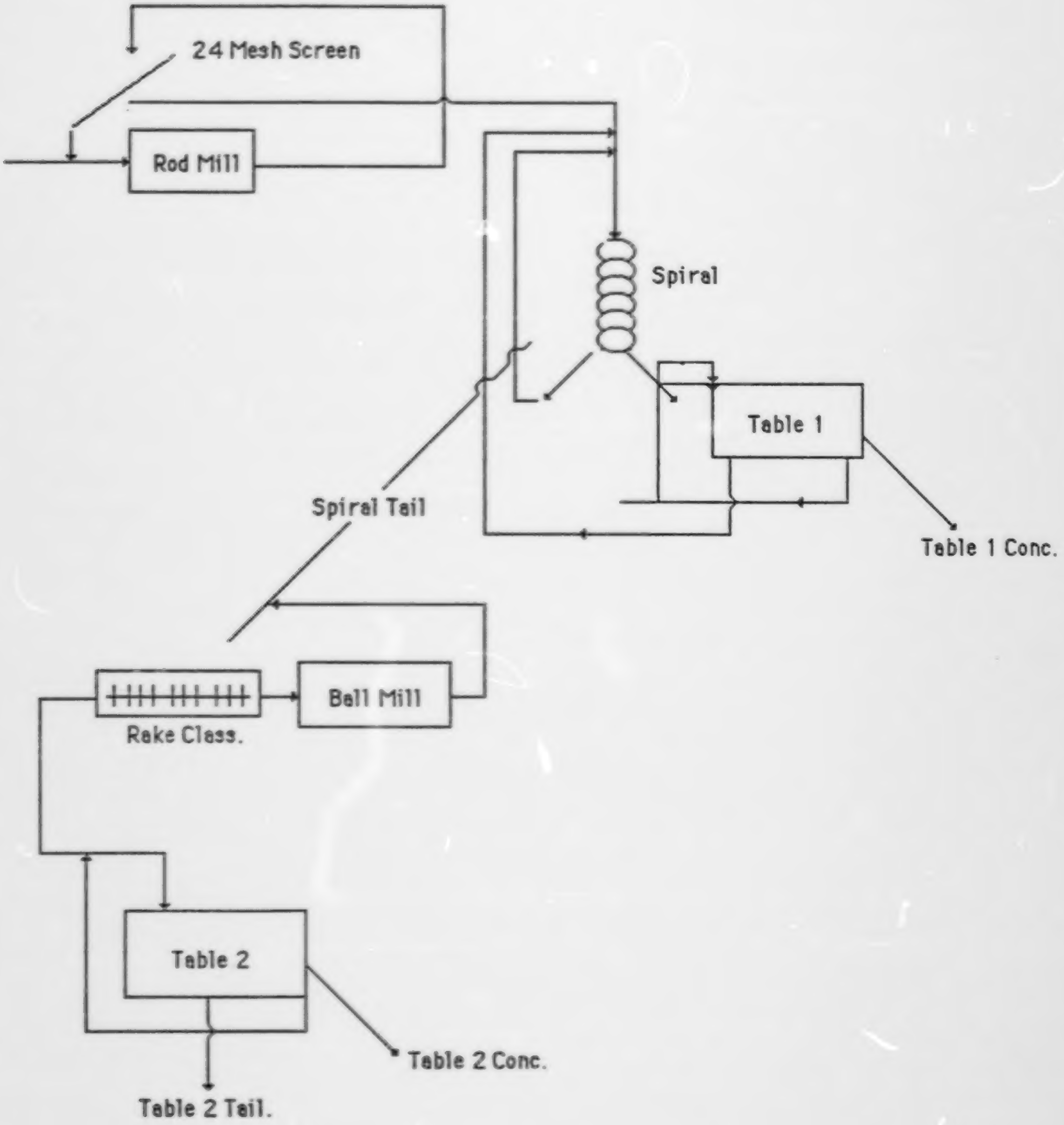
Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 28	0.4	0.4	99.6
35	5.9	6.3	93.7
48	13.4	19.7	80.3
65	14.3	34.0	66.0
100	12.3	46.3	53.7
150	10.0	56.3	43.7
200	7.4	63.7	36.3
270	5.5	69.2	30.8
400	1.5	70.7	29.3
- 400	29.3	100.0	-
Total	100.0	-	-

Rake Overflow

+ 100	0.3	0.3	99.7
150	1.6	1.9	98.1
200	5.4	7.3	92.7
270	9.6	16.9	83.1
400	11.0	27.9	72.1
- 400	72.1	100.0	-
Total	100.0	-	-

Test No. PP-2 - Continued

4. Flowsheet


24 Mesh Screen
Rod Mill
Spiral
Table 1
Spiral Tail
Table 1 Conc.
Ball Mill
Rake Class.
Table 2
Table 2 Conc.
Table 2 Tail.

Test No. PP-3 **WHOLE ORE**

1. Purpose: To continue operation of the circuit as in Test PP-2 but with the table-1 tailing combined with the spiral tailing, an increased ball load in the secondary mill and the feed rate decreased to 75 kg/h.

2. Method: The circuit was operated as in Test PP-2 but with the above changes. The ball load in was increased by 50 kg. Table 2 tailing was pumped to a cyclone for desliming ahead of the flotation circuit.

   The circuit was operated for 6 1/2 hours and the circuit products were sampled during the last 2 hours of operation.

3. Results: Problems still occurred with build up of circulating load around the ball mill circuit despite the changes made. Classifier overflow density could not be maintained high enough to get a coarse product.

3.1. Pulp Densities

		% Solids
Rod Mill Discharge	1685 gpL	61
Spiral Tailing	1175	23
Ball Mill Discharge	1885	71
Classifier Overflow	1110	15
Cyclone Overflow	1040	6
Cyclone Underflow	1285	33

3.2. Analyses

	Assays %		
Product	**Cr_2O_3**	**Fe**	**Mag Fe**
Minus 24 mesh	6.04	9.73	3.91
Spiral Concentrate	14.0	16.4	6.83
Spiral Tailing	1.59	5.98	2.58
Table-1 Concentrate	32.7	33.2	13.2
Table-1 Tailing	12.9	14.6	5.7
Classifier Overflow	4.37	8.20	3.36
Table-2 Concentrate	29.5	30.1	12.5
Table-2 Tailing	3.21	7.15	2.96
Cyclone Overflow	2.23	5.80	2.15
Cyclone Underflow	3.54	7.70	3.17

Test No. PP-3 - Continued

3.3. Metallurgical Results

Product	Weight %	Assays %			% Distribution			Ratio Cr:Fe
		Cr_2O_3	Fe	Mag Fe	Cr_2O_3	Fe	Mag Fe	
Spiral Concentrate	35.9	14.0	16.4	6.83	83.1	60.5	59.7	0.58
Spiral Tailing	64.1	1.59	5.98	2.58	16.9	39.5	40.3	
Minus 24 Mesh (Calc.)	100.0	6.04	9.72	4.10	100.0	100.0	100.0	
(Direct)	-	6.04	9.73	3.91	-	-	-	
Table-1 Concentrate	1.9	33.2	32.7	13.2	10.7	6.9	6.9	0.69
Table-1 Tailing	33.9	12.9	14.6	5.74	72.4	53.6	52.7	
Spiral Conc. (Calc.)	35.9	14.0	15.6	6.14	83.1	60.5	59.7	
(Direct)	-	14.0	16.4	6.83	-	-	-	
Spiral Tailing	64.1	1.59	5.98	2.58	16.9	39.5	40.3	
Table-1 Tailing	33.9	12.9	14.6	5.74	72.4	53.6	52.7	
Class. O'Flow (Calc.)	98.1	5.50	8.96	3.67	89.3	93.1	93.1	
(Direct)	-	4.37	8.20	3.36	-	-	-	
Table-2 Concentrate	4.2	30.1	29.5	12.5	26.5	14.6	14.9	0.70
Table-2 Tailing	93.8	3.21	7.15	2.96	62.8	78.5	78.2	
Class. O'Flow (Calc.)	98.1	4.37	8.11	3.37	89.3	93.1	93.1	
(Direct)	-	4.37	8.20	3.36	-	-	-	
Cyclone Overflow	23.9	2.23	5.80	2.15	11.1	16.1	14.7	
Cyclone Underflow	69.9	3.55	7.70	3.17	51.7	62.4	63.5	
Table-2 Tail. (Calc.)	93.8	3.21	7.22	2.91	62.8	78.5	78.2	
(Direct)	-	3.21	7.15	2.96	-	-	-	

3.4. Size Analyses:

Classifier Overflow

Mesh Size (Tyler)	% Retained		% Passing Cumulative
	Individual	Cumulative	
+ 65	0.1	0.1	99.9
100	0.1	0.2	99.8
150	0.1	0.3	99.7
200	2.2	2.5	97.5
270	8.9	11.4	88.6
400	12.9	24.3	75.7
- 400	75.7	100.0	-
Total	100.0	-	-

Test No. PP-3 - Continued

3.4. Size Analyses - Cont'd

Cyclone Underflow

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 150	0.2	0.2	99.8
200	3.7	3.9	96.1
270	14.0	17.9	82.1
400	12.1	30.0	70.0
- 400	70.0	100.0	-
Total	100.0	-	-

Minus 20 Mesh

+ 20	0.1	0.1	99.9
28	0.3	0.4	99.6
35	2.8	3.2	96.8
48	8.9	12.1	87.9
65	11.5	23.6	76.4
100	11.1	34.7	65.3
150	10.2	44.9	55.1
200	7.6	52.5	47.5
270	5.7	58.2	41.8
400	4.8	63.0	37.0
- 400	37.0	100.0	-
Total	100.0	-	-

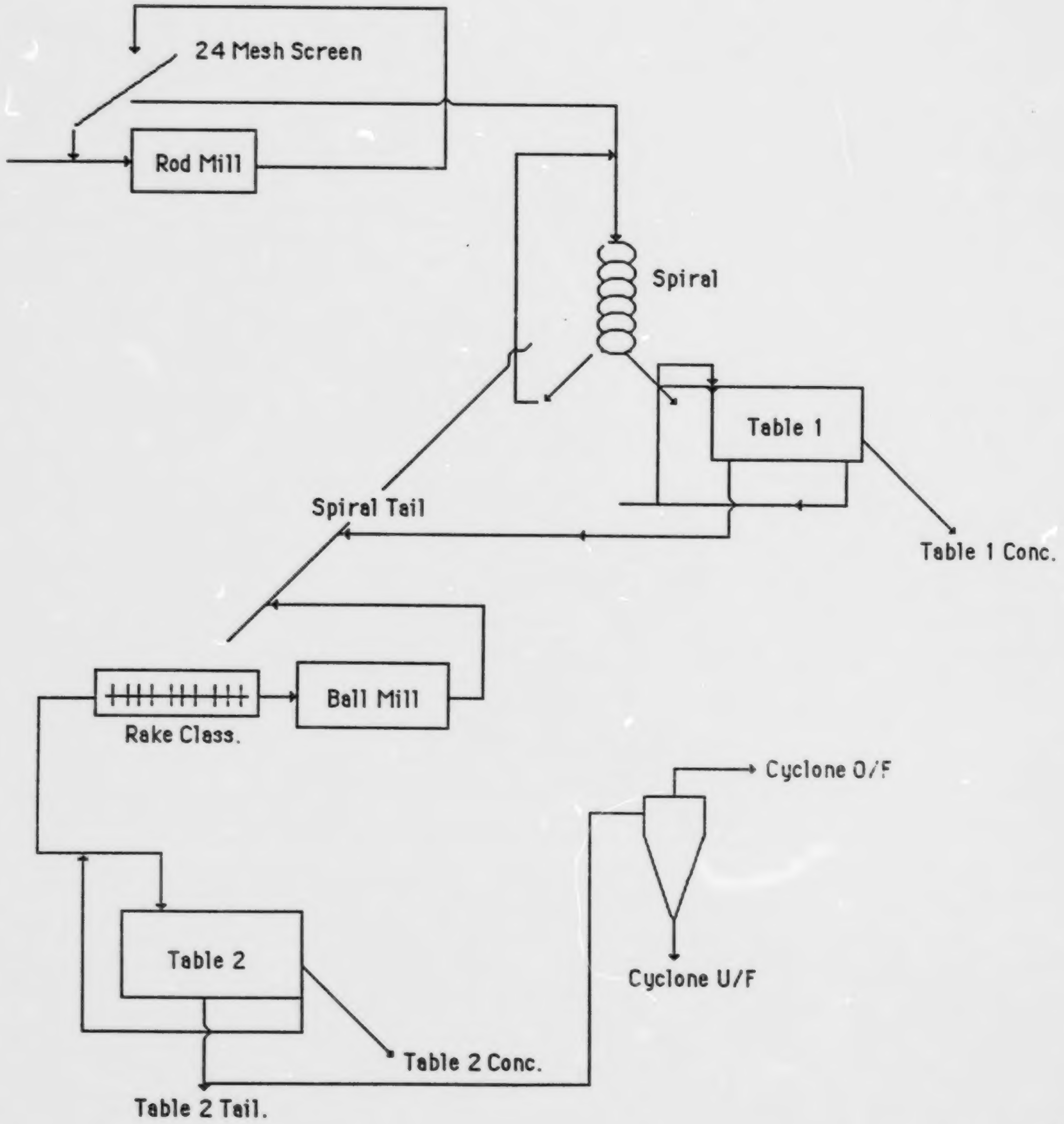
Cyclone Overflow

Particle Size	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 30.3 μm	0.2	0.2	99.8
21.1	0.2	0.4	99.6
14.5	0.7	1.1	98.9
11.2	2.2	3.3	96.7
- 11.2	96.7	100.0	-
Total	100.0	-	-

Specific Gravity 2.81

Test No. PP-3 - Continued

4. Flowsheet


24 Mesh Screen
Rod Mill
Spiral
Table 1
Spiral Tail
Table 1 Conc.
Rake Class.
Ball Mill
Cyclone O/F
Cyclone U/F
Table 2
Table 2 Conc.
Table 2 Tail.

Test No. PP-4

WHOLE ORE

1. Purpose: To continue operation of the circuit as in Test PP-3 with the flotation circuit operated also.

2. Method: The circuit was operated as in Test PP-3 with the cyclone underflow feeding the flotation circuit.

The cyclone underflow was conditioned with H_2SO_4 in a 30 L conditioner. Armac C was added to the conditioner overflow and rougher flotation was conducted in 2 Denver No. 7 cells. Two cleaner stages were conducted each consisting of 2 Denver No. 5 cells. The 2nd cleaner concentrate was treated by gravity separation on a 610 mm x 305 mm Denver table.

The circuit was operated for 5 hours and the circuit products were sampled during the last 2 hours of operation.

3. Results: Circuit operation appeared stable except for problems handling the circulating load in the ball mill circuit and too fine a product from this circuit. The small table operation in the flotation circuit was not satisfactory.

3.1. Flotation Reagents

Reagent	Point of Addition	Amount, kg/t
H_2SO_4	Conditioner	14.00
Armac C	Conditioner	0.20
H_2SO_4	1st Cleaner Feed	2.80

3.2. Pulp Densities and pH

		% Solids
Rod Mill Discharge	1720 gpL	63
Spiral Tailing	1215 gpL	27
Ball Mill Discharge	1815 gpL	68
Classifier Overflow	1110 gpL	15
Cyclone Overflow	1050 gpL	7
Cyclone Underflow	1345 gpL	39

	pH
Rougher	2.0
1st Cleaner	2.2
2nd Cleaner	2.6

Test No. PP-4 - Continued

3.3. Analyses

Product	Assays %		
	Cr_2O_3	Fe	Mag Fe
Minus 24 mesh	6.33	10.1	3.95
Spiral Concentrate	14.0	16.3	5.92
Spiral Tailing	1.55	6.31	2.64
Table-1 Concentrate	34.1	29.7	8.98
Table-1 Tailing	8.27	12.2	5.13
Classifier Overflow	4.11	8.50	3.32
Table-2 Concentrate	31.8	33.0	13.02
Table-2 Tailing	3.26	7.66	2.98
Cyclone Overflow	2.31	6.14	2.56
Cyclone Underflow	3.75	8.25	3.28
Table-3 Concentrate	34.4	25.3	3.92
Rougher Tailing	3.13	7.81	3.26

3.4. Metallurgical Results

Product	Weight %	Assays %			% Distribution			Ratio Cr:Fe
		Cr_2O_3	Fe	Mag Fe	Cr_2O_3	Fe	Mag Fe	
Spiral Concentrate	38.4	14.0	16.4	5.92	84.9	61.8	58.3	0.58
Spiral Tailing	61.6	1.55	6.31	2.64	15.1	38.2	41.7	
Minus 24 Mesh (Calc.)	100.0	6.33	10.2	3.90	100.0	100.0	100.0	
(Direct)	-	6.33	9.73	3.95	-	-	-	
Table-1 Concentrate	8.5	34.1	29.7	8.98	45.9	25.3	19.4	0.79
Table-1 Tailing	29.9	8.27	12.2	5.13	39.0	36.5	38.9	
Spiral Conc. (Calc.)	38.4	14.0	16.1	5.98	84.9	61.8	58.3	
(Direct)	-	14.0	16.4	5.92	-	-	-	
Spiral Tailing	61.6	1.55	6.31	2.64	15.1	38.2	41.7	
Table-1 Tailing	29.9	8.27	12.2	5.13	39.0	36.5	38.9	
Class. O'Flow (Calc.)	91.5	3.74	8.23	3.45	54.1	74.7	80.6	
(Direct)	-	4.11	8.50	3.32	-	-	-	
Table-2 Concentrate	2.7	31.8	33.0	13.0	12.5	8.7	9.5	0.66
Table-2 Tailing	88.8	3.26	7.66	2.98	41.6	65.9	71.1	
Class. O'Flow (Calc.)	91.5	4.11	8.41	3.28	54.1	74.7	80.6	
(Direct)	-	4.11	8.50	3.32	-	-	-	
Cyclone Overflow	30.2	2.31	6.14	2.56	10.0	18.3	20.4	
Cyclone Underflow	58.6	3.75	8.25	3.28	31.6	47.7	50.7	
Table-2 Tail (Calc.)	88.8	3.26	7.53	3.04	41.6	65.9	71.1	
(Direct)	-	3.26	7.66	2.98	-	-	-	
Table-3 Conc.	1.2	34.4	25.3	3.92	5.7	2.9	1.2	
Rougher Tail.	57.4	3.13	7.81	3.26	25.9	44.2	49.4	
Cyclone U'Flow (Calc.)	58.6	3.75	8.16	3.27	31.6	47.7	50.7	
(Direct)	-	3.75	8.25	3.28	-	-	-	

Test No. PP-4 - Continued

3.5. Size Analyses:

Minus 20 Mesh

Mesh Size (Tyler)	% Retained		% Passing
	Individual	Cumulative	Cumulative
+ 10	0.1	0.1	99.9
14	0.1	0.2	99.8
20	0.1	0.3	99.7
28	0.5	0.8	99.2
35	4.9	5.7	94.3
48	13.5	19.2	80.8
65	14.2	33.4	66.6
100	11.8	45.2	54.8
150	9.9	55.1	44.9
200	7.6	62.7	37.3
270	5.8	68.5	31.5
400	4.9	73.4	26.6
- 400	26.6	100.0	-
Total	100.0	-	-

Classifier Overflow

+ 150	1.1	1.1	98.9
200	6.5	7.6	92.4
270	12.0	19.6	80.4
400	13.3	32.9	67.1
- 400	67.1	100.0	-
Total	100.0	-	-

Cyclone Underflow

+ 65	0.1	0.1	99.9
100	0.2	0.3	99.7
150	1.0	1.3	98.7
200	5.8	7.1	92.9
270	14.2	21.3	78.7
400	15.6	36.9	63.1
- 400	63.1	100.0	-
Total	100.0	-	-

Test No. PP-4 - Continued

3.5. Size Analyses - Cont'd

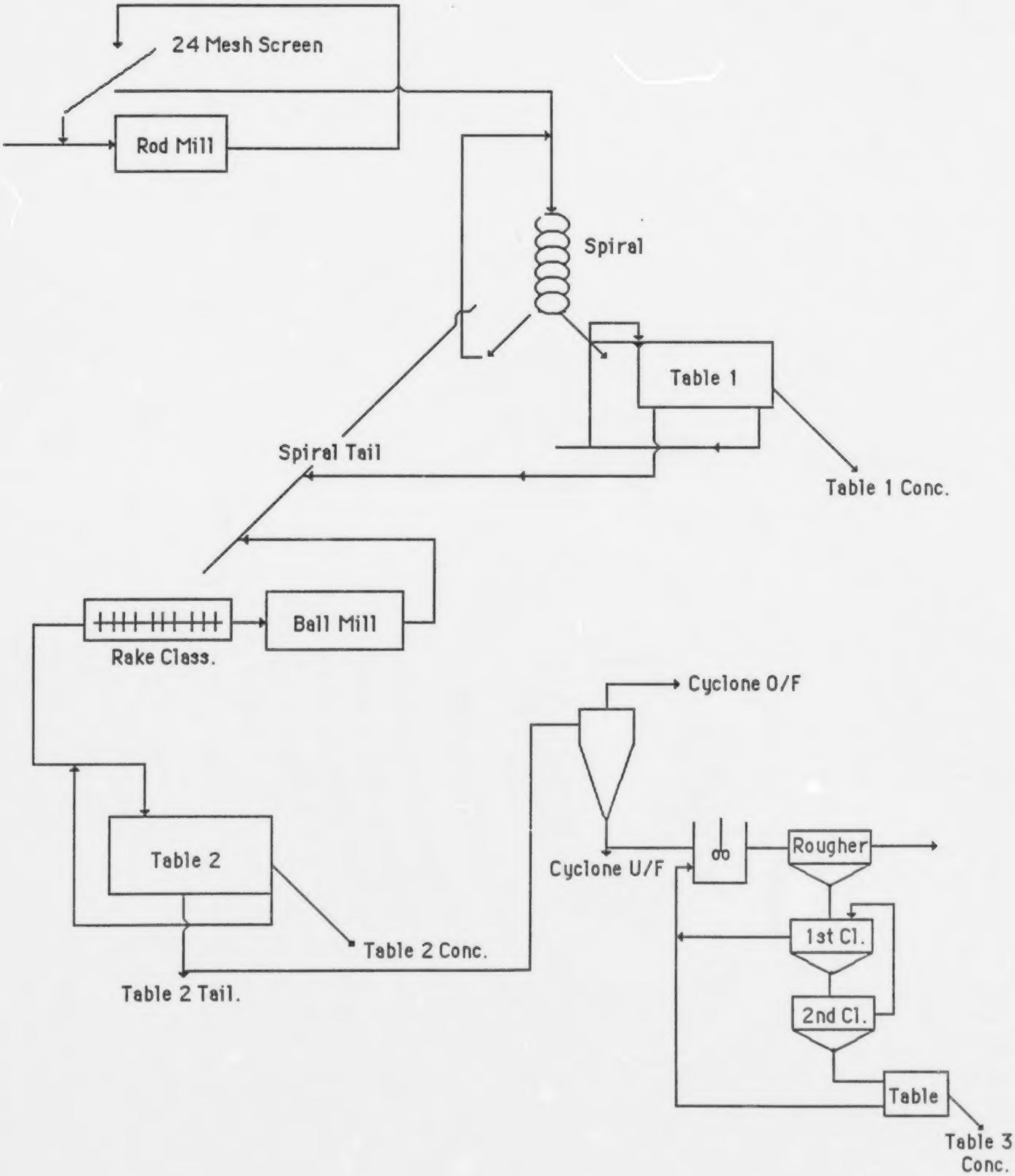
Cyclone Overflow

Particle Size	% Retained		% Passing
	Individual	Cumulative	Cumulative
+ 39.0 μm	0.1	0.1	99.9
30.2	0.1	0.2	99.8
21.1	0.3	0.5	99.5
14.5	1.7	2.2	97.8
11.2	5.1	7.3	92.7
- 11.2	92.7	100.0	-
Total	100.0	-	-

Specific Gravity 2.79

Test No. PP-4 - Continued

4. Flowsheet


24 Mesh Screen
Rod Mill
Spiral
Table 1
Table 1 Conc.
Spiral Tail
Rake Class.
Ball Mill
Cyclone O/F
Table 2
Table 2 Conc.
Table 2 Tail.
Cyclone U/F
Rougher
1st Cl.
2nd Cl.
Table
Table 3 Conc.

Test No. PP-5

WHOLE ORE

1. Purpose: To investigate the effect of a slightly finer primary grind and screen classification in the secondary grinding circuit.

2. Method: The 24 mesh screen in the primary circuit was replaced with a 35 mesh screen. The rake classifier in the secondary grinding circuit was replaced with a 84 mesh screen. The flotation circuit was not operated.

   The circuit was operated for 4 1/4 hours and the circuit products were sampled during the last 2 hours of operation.

3. Results: Circuit operation appeared to be very stable.

3.1. Pulp Densities

		% Solids
Rod Mill Discharge	1725 g/L	63
Spiral Tailing	1150	20
Ball Mill Discharge	1345	39
Minus 84 mesh	1060	9
Cyclone Overflow	1020	3
Cyclone Underflow	1285	34
Table-2 Tailing	1080	11

3.2. Chemical Analyses

	Assays %		
Product	Cr_2O_3	**Fe**	**Mag Fe**
Minus 35 mesh	6.05	9.43	3.95
Spiral Concentrate	22.4	20.7	7.24
Spiral Tailing	1.80	6.34	3.03
Table-1 Concentrate	37.3	30.2	10.0
Table-1 Tailing	19.7	18.6	7.63
Minus 84 mesh	5.18	8.83	3.36
Table-2 Concentrate	37.2	28.9	9.32
Table-2 Tailing	2.87	7.25	3.51
Cyclone Overflow	2.10	6.22	2.73
Cyclone Underflow	3.12	7.52	3.48

Test No. PP-5 - Continued

3.3. Metallurgical Results

Product	Weight %	Assays %			% Distribution			Ratio Cr:Fe
		Cr_2O_3	Fe	Mag Fe	Cr_2O_3	Fe	Mag Fe	
Spiral Concentrate	20.6	22.4	20.7	7.24	76.4	45.9	38.3	0.74
Spiral Tailing	79.4	1.80	6.34	3.03	23.6	54.1	61.7	
Minus 35 mesh (Calc)	100.0	6.05	9.30	3.90	100.0	100.0	100.0	
(Direct)	-	6.05	9.43	3.95	-	-	-	
Table-1 Concentrate	4.2	37.3	30.2	10.0	25.8	12.9	9.6	0.85
Table-1 Tailing	16.4	18.6	19.7	7.63	50.5	33.0	28.7	
Spiral Conc. (Calc.)	20.6	22.4	21.8	8.11	76.4	45.9	38.3	
(Direct)	-	22.4	20.7	7.24	-	-	-	
Spiral Tailing	79.4	1.80	6.34	3.03	23.6	54.1	61.7	
Table-1 Tailing	16.4	18.6	19.7	7.63	50.5	33.0	28.7	
Minus 84 mesh (Calc)	95.8	4.68	8.63	3.82	74.2	87.1	90.4	
(Direct)	-	5.18	8.50	3.36	-	-	-	
Table-2 Concentrate	5.4	37.2	28.9	9.32	30.1	16.1	12.4	0.88
Table-2 Tailing	90.4	3.26	7.66	3.51	44.0	71.0	78.0	
Minus 84 mesh (Calc)	95.8	5.18	8.86	3.84	74.2	87.1	90.4	
(Direct)	-	5.18	8.50	3.36	-	-	-	
Cyclone Overflow	22.2	2.10	6.22	2.73	7.9	15.0	15.8	
Cyclone Underflow	68.2	3.12	7.52	3.48	36.1	56.0	62.2	
Table-2 Tail (Calc)	90.4	2.87	7.20	3.30	44.0	71.0	78.0	
(Direct)	-	2.87	7.66	3.51	-	-	-	

Test No. PP-5 - Continued

3.4. Size Analyses:

Minus 35 Mesh

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 48	5.1	5.1	94.9
65	11.4	16.5	83.5
100	12.2	28.7	71.3
150	11.4	40.1	59.9
200	9.1	49.2	50.8
270	7.5	56.7	43.3
400	5.9	62.6	37.4
- 400	37.4	100.0	-
Total	100.0	-	-

Cyclone Underflow

+ 100	4.9	4.9	95.1
150	11.9	16.8	83.2
200	11.7	28.5	71.5
270	11.2	39.7	60.3
400	11.5	51.2	48.8
- 400	48.8	100.0	-
Total	100.0	-	-

Minus 84 Mesh

+ 100	3.9	3.9	96.1
150	9.1	13.0	87.0
200	8.3	21.3	78.7
270	8.1	29.4	70.6
400	8.8	38.2	61.8
- 400	61.8	100.0	-
Total	100.0	-	-

Test No. PP-5 - Continued

3.4. Size Analyses - Cont'd

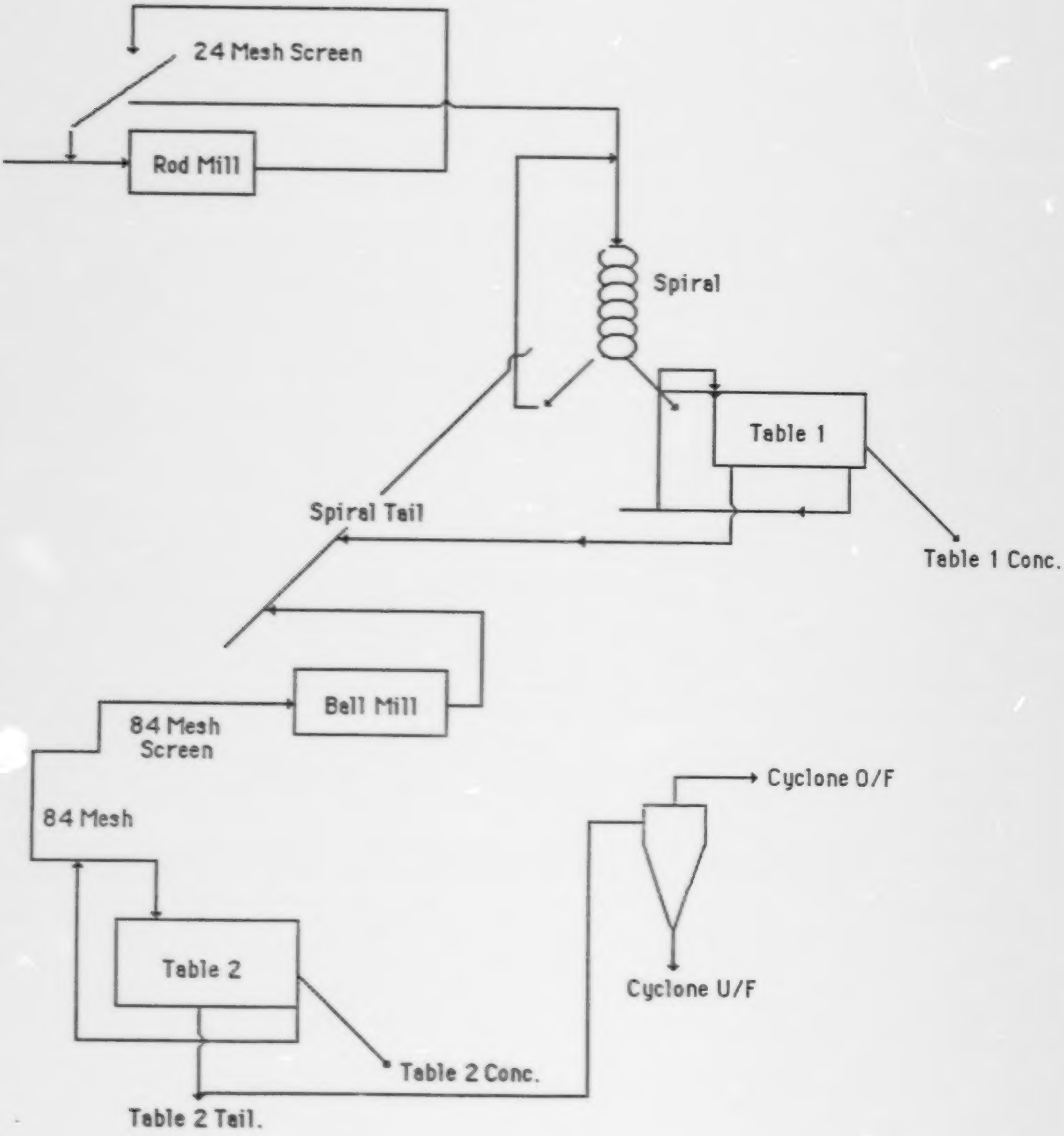
Cyclone Overflow

Particle Size	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 39.4 μm	0.1	0.1	99.9
30.5	0.2	0.3	99.7
21.3	0.8	1.1	98.9
14.6	2.3	3.4	96.6
11.3	3.0	6.4	93.6
- 11.3	93.6	100.0	-
Total	100.0	-	-

Specific Gravity 2.76

Test No. PP5 - Continued

4. Flowsheet


24 Mesh Screen
Rod Mill
Spiral
Table 1
Table 1 Conc.
Spiral Tail
Ball Mill
84 Mesh Screen
84 Mesh
Cyclone O/F
Cyclone U/F
Table 2
Table 2 Conc.
Table 2 Tail.

Test No. PP-6

WHOLE ORE

1. Purpose: To continue operation of the circuit as in Test PP-5 with the flotation stage added.

2. Method: The circuit was operated as in Test PP-5 with the flotation circuit added.

The circuit was operated at a feed rate of 75 kg/h for 6 1/2 hours and the circuit products were sampled during the last 2 hours of operation.

3. Results: Circuit operation appeared stable and an attempt was made to cut a lower grade concentrate.

3.1. Reagent Additions

Reagent	**Point of Addition**	**Amount kg/t**
Armac C	Conditioner	0.27
H_2SO_4	Conditioner	17.02
H_2SO_4	1st Cleaner	1.44

3.2. Pulp Densities

		% Solids
Rod Mill Discharge	1780 g/L	66
Spiral Tailing	1190	24
Ball Mill Discharge	1480	46
Minus 80 Mesh	1080	11
Table Tailing	1085	12
Cyclone Overflow	1010	2
Cyclone Underflow	1135	18

3.3. pH

Rougher	1.9
1st Cleaner	2.3
2nd Cleaner	2.5

3.4. Chemical Analyses

		Assays %	
Product	**Cr_2O_3**	**Fe**	**Mag Fe**
Minus 35 mesh	6.24	9.65	4.37
Spiral Concentrate	22.6	21.9	7.92
Spiral Tailing	1.99	6.37	3.15
Table-1 Concentrate	29.1	26.1	9.29
Table-1 Tailing	2.73	7.63	4.06
Minus 84 Mesh	2.31	6.83	3.36
Table-2 Concentrate	18.3	22.9	11.6
Table-2 Tailing	1.79	6.51	3.24
Cyclone Overflow	1.69	5.73	2.46
Cyclone Underflow	2.08	6.73	3.32
Flotation Concentrate	6.27	7.54	1.87
Flotation Tailing	1.77	6.87	3.31

Test No. PP-6 - Continued

3.5. Metallurgical Results

Product	Weight %	Assays %			% Distribution			Ratio Cr:Fe
		Cr_2O_3	Fe	Mag Fe	Cr_2O_3	Fe	Mag Fe	
Spiral Concentrate	20.6	22.6	21.9	7.92	74.7	47.2	39.5	0.71
Spiral Tailing	79.4	1.99	6.37	3.15	25.3	52.8	60.5	
Minus 35 Mesh (Calc)	100.0	6.24	9.57	4.13	100.0	100.0	100.0	
(Direct)	-	6.24	9.65	4.37	-	-	-	
Table-1 Concentrate	15.5	29.1	26.1	9.29	72.5	43.1	34.6	0.76
Table-1 Tailing	5.1	2.73	7.63	4.06	2.2	4.1	4.9	
Spiral Conc. (Calc)	20.6	22.6	21.5	8.00	74.7	47.2	39.5	
(Direct)	-	22.6	21.9	7.92	-	-	-	
Spiral Tailing	79.4	1.99	6.37	3.15	25.3	52.8	60.5	
Table-1 Tailing	5.1	2.73	7.63	4.06	2.2	4.1	4.9	
Minus 84 Mesh (Calc)	84.5	2.03	6.45	3.20	27.5	56.9	65.4	
(Direct)	-	2.31	6.83	3.36	-	-	-	
Table-2 Concentrate	1.7	18.3	22.9	11.6	4.3	3.7	4.4	0.55
Table-2 Tailing	82.8	1.99	6.51	3.24	23.3	53.2	61.1	
Class. O/F (Calc)	84.5	2.31	6.83	3.40	27.5	56.9	65.4	
(Direct)	-	2.31	6.25	3.36	-	-	-	
Cyclone Overflow	19.1	1.69	5.73	2.46	4.6	10.8	11.1	
Cyclone Underflow	63.7	2.08	6.73	3.32	18.7	42.4	50.0	
Table-2 Tail (Calc)	82.8	1.99	6.50	3.12	23.3	53.2	61.1	
(Direct)	-	1.99	6.51	3.24	-	-	-	
Flotation Concentrate	4.4	6.27	7.54	1.87	3.9	3.3	1.9	
Flotation Tailing	59.3	1.77	6.37	3.31	14.8	37.3	46.4	
Cyclone U/F (Calc)	63.7	2.08	6.45	3.21	18.7	42.4	50.0	
(Direct)	-	2.08	6.73	3.32	-	-	-	

3.5. Size Analyses:

Cyclone Underflow

Mesh Size (Tyler)	% Retained		% Passing Cumulative
	Individual	Cumulative	
+ 100	4.8	4.8	95.2
150	11.9	16.7	83.3
200	9.6	26.3	73.7
270	9.2	35.5	64.5
400	10.3	45.8	54.2
- 400	54.2	100.0	-
Total	100.0	-	-

Test No. PP-6 - Continued

3.5. Size Analyses - Cont'd

Minus 84 Mesh

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 100	5.4	5.4	94.6
150	10.6	16.0	84.0
200	8.9	24.9	75.1
270	7.8	32.7	67.3
400	6.2	38.9	61.1
- 400	61.1	100.0	-
Total	100.0	-	-

Minus 35 Mesh

+ 48	10.3	10.3	89.7
65	11.6	21.9	78.1
100	13.6	35.5	64.5
150	12.0	47.5	52.5
200	8.4	55.9	44.1
270	6.2	62.1	37.9
400	5.1	67.2	32.8
- 400	32.8	100.0	-
Total	100.0	-	-

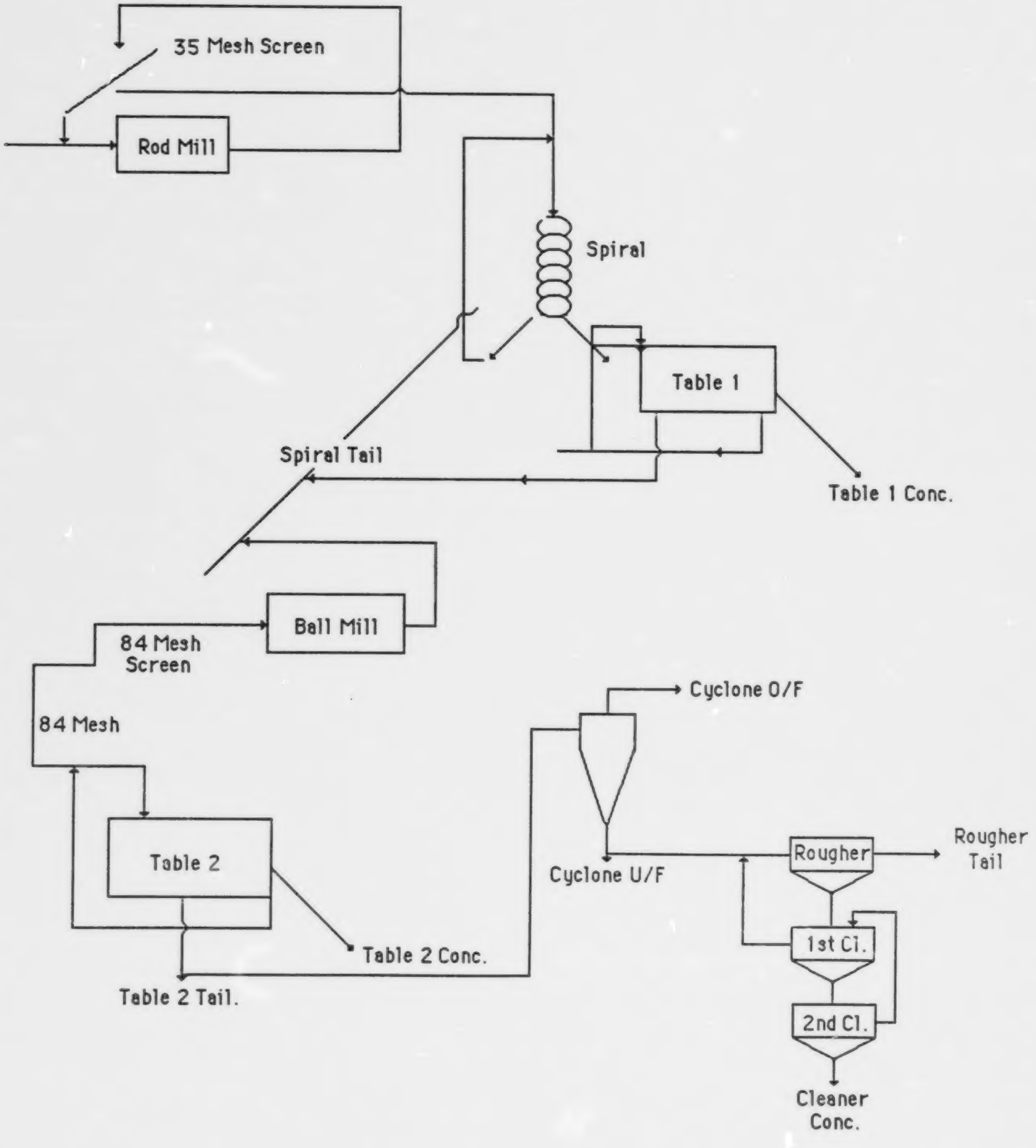
Cyclone Overflow

Particle Size	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 39.5 μm	0.1	0.1	99.9
30.6	0.2	0.3	99.7
21.4	1.1	1.4	98.6
14.7	3.0	4.4	95.6
11.3	3.0	7.4	92.6
- 11.3	92.6	100.0	-
Total	100.0	-	-

Specific Gravity 2.74

Test No. PP-6 - Continued

4. Flowsheet


35 Mesh Screen
Rod Mill
Spiral
Table 1
Spiral Tail
Table 1 Conc.
Ball Mill
84 Mesh
Screen
84 Mesh
Cyclone O/F
Table 2
Cyclone U/F
Rougher
Rougher
Tail
1st Cl.
Table 2 Conc.
Table 2 Tail.
2nd Cl.
Cleaner
Conc.

Test No. PP-7

WHOLE ORE

1. Purpose: To continue operation as in Test PP-6 but with the Table-1 tailing recirculated to the spiral feed.

2. Method: The circuit was operated for 6 1/2 hours and two sample periods were concluded:

7A - 2 - 3 1/2 hours into run

7B - 5 - 6 1/2 hours into run

Table and spiral cutter positions were adjusted between the tests.

3. Results:

3.1. Reagent Additions

Reagent	**Point of Addition**	**Amount, kg/t**	
		7A	**7B**
Armac C	Conditioner	0.54	0.54
H_2SO_4	Conditioner	10.8	14.2
H_2SO_4	1st Cleaner	2.9	3.1

3.2. Pulp Densities

			% Solids	
	7A	7B	7A	7B
Rod Mill Discharge	1860g/L	1866g/L	70	70
Spiral Tailing	1135	1155	18	20
Ball Mill Discharge	1390	1650	43	62
Minus 80 Mesh	1100	1110	14	15
Table Tailing	1060	1055	9	8
Cyclone Overflow	1010	1010	2	2
Cyclone Underflow	1185	1175	24	23

3.3. pH

Rougher	2.7	2.4
1st Cleaner	2.4	2.2
2nd Cleaner	3.0	2.8

3.4. Chemical Analyses

Product	**Test 7A**			**Test 7B**		
	Cr_2O_3	**Fe**	**Mag Fe**	**Cr_2O_3**	**Fe**	**Mag Fe**
Minus 35 Mesh	7.13	10.4	4.75	7.49	10.5	3.82
Spiral Tailing	2.14	6.69	3.24	2.58	7.36	2.89
Table-1 Conc.	30.5	26.5	8.52	32.7	28.5	8.45
Minus 84 Mesh	2.14	6.69	3.29	2.58	7.36	3.29
Table-2 Conc.	15.9	21.8	9.60	21.7	26.6	11.9
Table-2 Tail.	1.95	6.51	2.93	2.13	6.90	2.76
Cyclone O'Flow	1.92	5.96	2.45	1.59	6.05	1.88
Cyclone U'Flow	1.98	6.44	2.52	2.38	7.35	2.91
Flotation Conc.	4.09	5.61	1.33	7.76	9.24	2.51
Flotation Tail.	1.90	6.45	3.04	2.08	6.91	2.73

Test No. PP-7 - Continued

3.5. Metallurgical Results - TEST 7A

Product	Weight %	Assays %			% Distribution			Ratio Cr:Fe
		Cr_2O_3	Fe	Mag Fe	Cr_2O_3	Fe	Mag Fe	
Table-1 Concentrate	17.6	30.5	26.5	8.52	75.3	45.8	36.0	0.79
Spiral Tailing	82.4	2.14	6.69	3.24	24.7	54.2	64.0	
Minus 35 Mesh (Calc.)	100.0	7.13	10.2	4.17	100.0	100.0	100.0	
(Direct)	-	7.13	10.4	4.75	-	-	-	
Table-2 Concentrate	1.1	15.9	21.8	9.60	2.5	2.4	2.8	0.50
Table-2 Tailing	81.3	1.95	6.51	2.93	22.2	51.8	61.3	
Minus 84 Mesh (Calc.)	82.4	2.14	6.72	3.02	24.7	54.2	64.0	
(Direct)	-	2.14	6.69	3.29	-	-	-	
Cyclone Overflow	40.6	1.92	5.96	2.45	10.9	23.7	25.6	0.22
Cyclone Underflow	40.6	1.98	6.44	2.52	11.3	25.6	26.3	
Table-2 Tail. (Calc.)	81.3	1.95	6.20	2.49	22.2	51.8	61.3	
(Direct)	-	1.95	6.51	2.93	-	-	-	
Flotation Concentrate	1.5	4.09	5.61	1.33	0.9	0.8	0.5	0.50
Flotation Tailing	39.2	1.90	6.45	3.04	10.4	24.7	30.6	
Cyclone U/F (Calc.)	40.6	1.98	6.42	2.98	11.3	25.6	26.3	
(Direct)	-	1.98	6.44	2.52	-	-	-	

Test 7B

Table-1 Concentrate	16.3	32.7	28.5	8.45	71.2	43.0	36.3	0.79
Spiral Tailing	83.7	2.58	7.36	2.89	28.8	57.0	63.7	
Minus 35 Mesh (Calc.)	100.0	7.49	10.8	3.80	100.0	100.0	100.0	
(Direct)	-	7.49	10.5	3.82	-	-	-	
Table-2 Concentrate	1.9	21.7	26.6	11.9	5.6	4.7	5.9	0.56
Table-2 Tailing	81.8	2.13	6.90	2.76	23.3	52.3	57.8	
Minus 84 Mesh (Calc.)	83.7	2.58	7.35	2.97	28.8	57.0	63.7	
(Direct)	-	2.58	7.36	3.29	-	-	-	
Cyclone Overflow	25.9	1.59	6.05	1.88	5.5	14.5	12.5	0.18
Cyclone Underflow	55.9	2.38	7.35	2.91	17.8	38.1	41.7	
Table-2 Tail. (Calc.)	81.8	2.13	6.94	2.58	23.3	52.3	57.8	
(Direct)	-	2.13	6.90	2.76	-	-	-	
Flotation Concentrate	3.0	7.76	9.24	2.51	3.1	2.5	1.9	0.57
Flotation Tailing	52.9	2.08	6.91	2.73	14.7	33.9	37.0	
Cyclone U/F (Calc.)	55.9	2.38	7.03	2.72	17.8	38.1	41.7	
(Direct)	-	2.38	7.35	2.91	-	-	-	

Test No. PP-7 - Continued

3.6. Size Analyses:

Test 7A

Rod Mill Feed

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 3	1.5	1.5	98.5
4	27.5	29.0	71.0
6	17.9	46.9	53.1
8	11.2	58.1	41.9
10	8.0	66.1	33.9
14	6.6	72.7	27.3
20	3.7	76.4	23.6
28	3.8	80.2	19.8
35	2.8	83.0	17.0
48	3.0	86.0	14.0
65	2.7	88.7	11.3
100	1.8	90.5	9.5
150	1.5	92.0	8.0
200	1.1	93.1	6.9
270	0.8	93.9	6.1
400	0.7	94.6	5.4
- 400	5.4	100.0	-
Total	100.0	-	-

Cyclone Underflow

+ 100	4.7	4.7	95.3
150	14.5	19.2	80.8
200	14.5	33.7	66.3
270	11.2	44.9	55.1
400	9.9	54.8	45.2
- 400	45.2	100.0	-
Total	100.0	-	-

Test No. PP-7 - Continued

3.6. Size Analyses - Cont'd (Test 7A)

Minus 35 Mesh

Mesh Size (Tyler)	% Retained		% Passing Cumulative
	Individual	Cumulative	
+ 48	9.7	9.7	90.3
65	8.7	18.4	81.6
100	12.8	31.2	68.8
150	12.6	43.8	56.2
200	10.2	54.0	46.0
270	7.5	61.5	38.5
400	6.4	67.9	32.1
- 400	32.1	100.0	-
Total	100.0	-	-

Minus 84 Mesh

+ 100	4.9	4.9	95.1
150	12.8	17.7	82.3
200	9.5	27.2	72.8
270	7.4	34.6	65.4
400	6.2	40.8	59.2
- 400	59.2	100.0	-
Total	100.0	-	-

Cyclone Overflow

Particle Size	% Retained		% Passing Cumulative
	Individual	Cumulative	
+ 39.5 μm	0.3	0.3	99.7
30.6	0.6	0.9	99.1
21.4	2.0	2.9	97.1
14.7	4.0	6.9	93.1
11.3	4.1	11.0	89.0
- 11.3	89.0	100.0	-
Total	100.0	-	-

Specific Gravity 2.76

Test No. PP-7 - Continued

3.6. Size Analyses - Cont'd

Test 7B

Cyclone Underflow

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 100	4.0	4.0	96.0
150	10.3	14.3	85.7
200	9.6	23.9	76.1
270	8.3	32.2	67.8
400	10.4	42.6	57.4
- 400	57.4	100.0	-
Total	100.0	-	-

Minus 84 Mesh

+ 100	4.3	4.3	95.7
150	9.7	14.0	86.0
200	7.7	21.7	78.3
270	6.9	28.6	71.4
400	5.5	34.1	65.9
- 400	65.9	100.0	-
Total	100.0	-	-

Minus 35 Mesh

+ 48	12.1	12.1	87.9
65	10.2	22.3	77.7
100	12.8	35.1	64.9
150	11.5	46.6	53.4
200	8.2	54.8	45.2
270	7.2	62.0	38.0
400	5.6	67.6	32.4
- 400	32.4	100.0	-
Total	100.0	-	-

Test No. PP-7 - Continued

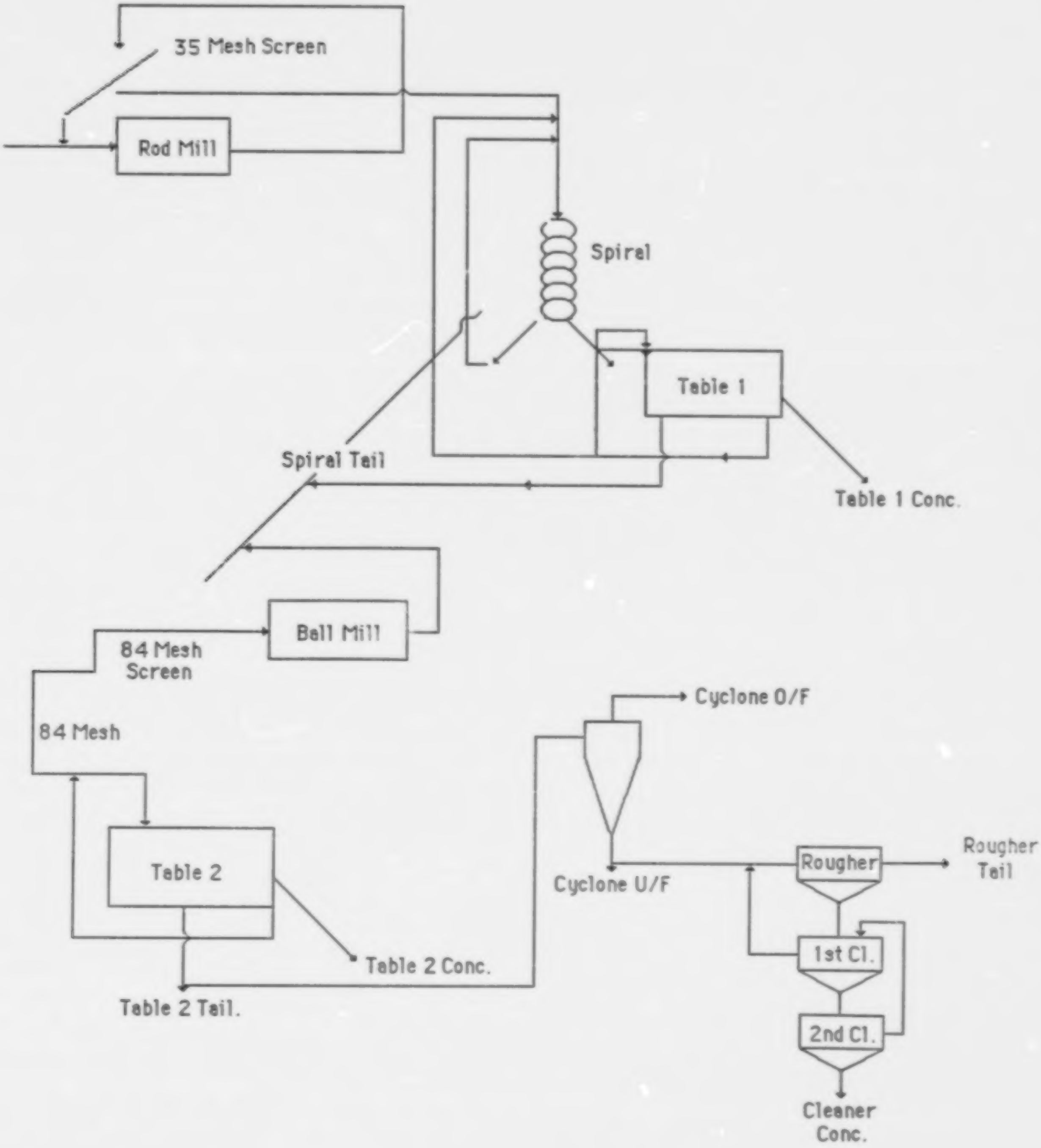
3.6. Size Analyses (Test 7B) - Cont'd

Cyclone Overflow

Particle Size	% Retained		% Passing
	Individual	Cumulative	Cumulative
+ 39.1 µm	0.1	0.1	99.9
30.3	0.3	0.4	99.6
21.1	0.2	0.6	99.4
14.5	3.3	3.9	96.1
11.2	3.1	7.0	93.0
- 11.2	93.0	100.0	-
Total	100.0	-	-

Specific Gravity 2.78

4. Flowsheet


35 Mesh Screen
Rod Mill
Spiral
Table 1
Spiral Tail
Table 1 Conc.
Ball Mill
84 Mesh
Screen
84 Mesh
Cyclone O/F
Table 2
Cyclone U/F
Rougher
Rougher
Tail
1st Cl.
Table 2 Conc.
Table 2 Tail.
2nd Cl.
Cleaner
Conc.

Test No. PP7-1

Purpose: To conduct a magnetic separation on sample PP-7 Table 1 concentrate.

Procedure: A 1.0 kg dry sample was passed through a Jeffrey magnetic separator type 125 at 2.5 ampls.
Products were sent for assay.

Metallurgical Results

Product	Weight %		Assays, %		Cr/Fe	% Distribution			
	Ind.	O'all	Cr_2O_3	Fe		Ind.		O'all	
						Cr_2O_3	Fe	Cr_2O_3	Fe
Non-Magnetics	53.9	9.2	36.3	21.3	1.17	61.7	41.8	45.2	18.6
Magnetics	46.1	7.8	26.3	34.5		38.3	58.2	28.1	25.8
Head(Calc.)	100.0	17.0	31.7	27.3		100.0	100.0	73.3	44.4

Test No. PP7-2

Purpose: To conduct a magnetic separation on sample PP7 Table 1 concentrate after grinding.

Procedure: A 1.0 kg dry sample was ground at 50 % solids for 15 minutes in the laboratory ball mill.
The sample was then passed through a Jeffrey magnetic separator type 125 at 2.5 amp and the mags were passed at 1.0 amp.
Products were sent for assay.

Metallurgical Results

Product	Weight %		Assays, %		Cr/Fe	% Distribution			
						Ind.		O'all	
	Ind.	O'all	Cr_2O_3	Fe		Cr_2O_3	Fe	Cr_2O_3	Fe
2.0A Non-Mags	73.4	12.5	34.9	21.8	1.10	80.5	58.1	59.0	25.8
1.0A Non-Mags	7.6	1.3	29.2	30.4	0.66	7.5	8.7	5.5	3.8
1.0A Mags	19.0	3.2	18.4	46.1		12.0	33.2	8.8	14.8
Head (Calc.)	100.0	17.0	31.8	27.5		100.0	100.0	73.3	44.4

Calculated Grades and Recoveries

Products 1+2	81.0	13.8	34.4	22.6	1.04	88.0	66.8	64.5	29.6

Test No. PP7-3

Purpose: To conduct a magnetic separation on sample PP7 Table 1 concentrate after screening.

Procedure: An approximate 50 kg dry sample was screened to obtain the following fractions: +65 mesh, +100 mesh, -100 mesh
The -100 mesh was sent for assay.
The +65 mesh and +100 mesh were tabled on a Wilfley table to obtain a concentrate.
The +65 mesh and +100 mesh concentrates were passed through a Jeffrey magnetic separator Type 125 at 2.5 amps.
Products were sent for assay.

Metallurgical Results

Product	Weight %		Assays, %		Cr/Fe	% Distribution			
						Ind.		O'all	
	Ind.	O'all	Cr_2O_3	Fe		Cr_2O_3	Fe	Cr_2O_3	Fe
+65 M Non-Mags	14.0	2.4	37.0	22.2	1.14	16.2	11.4	11.9	5.1
+65M Mags	7.7	1.3	27.4	33.5		6.6	9.5	4.8	4.2
+65M Table Tail.	13.8	2.4	33.3	26.8	0.85	14.4	13.6	10.6	6.0
+100M Non-Mags	8.4	1.4	38.4	22.5	1.17	10.1	6.9	7.4	3.1
+100M Mags	3.6	0.6	27.3	35.4		3.1	4.7	2.3	2.1
+100M Table Tail.	2.8	0.5	36.9	26.6	0.95	3.2	2.7	2.3	1.2
-100M	49.7	8.4	29.8	28.1	0.73	46.4	51.2	34.0	22.7
Head (Calc.)	100.0	17.0	31.9	27.3		100.0	100.0	73.3	44.4

Calculated Grades and Recoveries

Products 1+4+7	72.1	12.2	32.2	26.3	0.84	72.7	69.5	53.3	30.9
Products 1+2+4+5	33.7	5.7	34.1	26.3	0.89	36.0	32.5	26.4	14.5
Products 1 - 6	50.3	8.6	34.1	26.4	0.88	53.6	48.8	39.3	21.7
Products 1+2	21.7	3.7	33.4	26.2	0.87	22.8	20.9	16.7	9.3
Products 4+5	12.0	2.0	35.1	26.3	0.91	13.2	11.6	9.7	5.2
Products 1 - 3	35.5	6.1	33.5	26.5		37.2	34.5	27.3	15.3
Products 4 to 6	14.8	2.5	35.4	26.4		16.4	14.3	12.0	6.4

Test No. PP7-4

Purpose: To conduct a magnetic separation on Sample PP7 float concentrate.

Procedure: An approximate 40 kg dry sample was tabled on a Wilfley table to obtain a a concentrate. The concentrate was passed through a Jeffrey magnetic separator Type 125 at 1.0 amps. The non-magnetic portion was passed through the Jeffrey separator again at 2.0 amps. All products were sent for assay.

Metallurgical Results

Product	Weight %		Assays, %			Cr/Fe	% Distribution					
							Individual			Overall		
	Ind.	O'all	Cr_2O_3	Fe	Mag Fe		Cr_2O_3	Fe	Mag Fe	Cr_2O_3	Fe	Mag Fe
1. Non-Mags	5.4	0.1	12.7	8.33	0.19	1.04	21.5	10.5	1.3	0.6	0.3	<0.1
2. 2.0A Mags	0.1	<0.1	11.2	42.4	32.8		0.4	1.0	4.1	<0.1	<0.1	0.1
3. 1.0A Mags	0.5	<0.1	10.7	35.6	24.7		1.7	4.2	15.3	0.1	0.1	0.3
4. Table Tail.	94.0	2.1	2.59	3.83	0.68		76.4	84.3	79.3	2.3	2.1	1.4
Head (Calc.)	100.0	2.2	3.19	4.27	0.81		100.0	100.0	100.0	3.0	2.5	1.8

Calculated Grades and Recoveries

Products 1+2	5.5	0.1	12.7	8.95	0.78	0.97	21.9	11.5	5.4	0.6	0.3	0.1
Products 1-3	6.0	0.1	12.5	11.2	2.78	0.76	23.6	15.7	20.7	0.7	0.4	0.4

Test No. PP7-5

Purpose:	To upgrade the Table 2 concentrate from PP-7 by gravity and magnetic separation.
Procedure:	The sample was tabled on a Wilfley table with middling recirculation. The table concentrate was further treated by magnetic separation. It was fed to the Jeffrey separator at 1.0A and the non-mags were repassed at 2.0A.
Feed:	~ 1500 g PP-7 Table 2 concentrate.

Metallurgical Results

Product	Weight %		Assays,%		Cr/Fe	% Distribution			
						Cr_2O_3		Fe	
	Ind.	O'all	Cr_2O_3	Fe		Ind.	O'all	Ind.	O'all
1. Non-Mags	35.3	0.5	28.4	17.6	1.10	50.9	4.1	26.3	6.4
2. 2.0A Mags	1.1	<0.1	19.2	30.9		1.1	0.1	1.4	0.3
3. 1.0A Mags	26.6	0.4	15.8	36.0		21.3	1.7	40.6	9.8
4. Table Midds.	26.4	0.4	13.7	19.2		18.4	1.5	21.5	5.2
5. Table Tail.	10.6	0.2	15.4	22.7		8.3	0.7	10.2	2.5
Head(Calc.)	100.0	1.5	19.7	23.6		100.0	8.1	100.0	24.2

Calculated Grades and Recoveries

Products 1+2	36.4	0.5	28.1	18.0	1.07	52.0	4.2	27.7	6.7
Products 1-3	63.0	0.9	22.9	25.6	0.61	73.3	5.9	68.3	16.5
Products 4+5	37.0	0.6	14.2	20.2		26.7	2.2	31.7	7.7

Test No. PP-8 **Sorting Accept Fraction**

1. Purpose: To investigate the response of the accept fraction from the Ore Sorting testwork to the developed flowsheets.

2. Method: The circuit was operated for 7 hours at a feed rate of 75 kg/h and two sample periods were conducted.

   8A - From 2-3 1/2 hours into run - Flowsheet Test 6 with Table-1 tailing not recirculatec

   8B - From 5 1/2 - 7 hours into run - Flowsheet Test 7 with Table-1 tailing recirculated to gravit rougher feed.

3. Results:

3.1. Reagent Additions

Reagent	Point of Add'n	Amount, kg/t 8A	8B
Armac C	Conditioner	0.52	0.54
H_2SO_4	Conditioner	18.2	16.8
H_2SO_4	1st Cleaner	3.6	4.2

3.2. Pulp Densities

	8A	8B	% Solids 8A	8B
Rod Mill Discharge	1825g/L	1690g/L	68	62
Spiral Tailing	1245	1160	30	21
Ball Mill Discharge	1495	1345	50	39
Minus 80 Mesh	1130	1130	17	17
Table Tailing	1090	1120	12	16
Cyclone Overflow	1140	1125	19	17
Cyclone Underflow	1015	1015	2	2

3.3. pH

Rougher	2.2	2.1
1st Cleaner	2.2	2.2
2nd Cleaner	2.3	2.3

3.4. Chemical Analyses

	Test 8A			Test 8B		
Product	Cr_2O_3	Fe	Mag Fe	Cr_2O_3	Fe	Mag Fe
Minus 35 Mesh	10.8	11.2	2.24	11.1	10.8	2.20
Spiral Conc.	21.6	17.3	3.32	-	-	-
Spiral Tail.	3.22	6.17	2.12	3.94	6.27	1.57
Table-1 Conc.	33.2	24.9	4.55	27.9	21.6	5.15
Table-1 Tail.	13.1	12.0	3.44	-	-	-
Minus 84 Mesh	6.00	8.05	1.97	3.94	6.64	1.58
Table-2 Conc.	32.9	25.1	5.42	26.2	21.4	5.15
Table-2 Tail.	3.56	6.50	2.34	3.83	6.50	1.58
Cyclone Overflow	2.97	6.01	1.90	3.37	6.03	1.34
Cyclone Underflow	3.87	6.82	2.83	4.11	6.79	1.80
Flotation Conc.	10.8	10.9	2.57	13.2	11.9	2.24
Flotation Tail.	2.39	5.92	2.38	2.75	5.57	1.54

3.5. Metallurgical Results

Test 8A

Product	Weight %	Assays %			% Distribution			Ratio Cr:Fe
		Cr_2O_3	Fe	Mag Fe	Cr_2O_3	Fe	Mag Fe	
Spiral Concentrate	41.2	21.6	17.3	3.32	82.5	66.3	52.4	0.85
Spiral Tailing	58.8	3.22	6.17	2.12	17.5	33.7	47.6	
Minus 35 Mesh (Calc.)	100.0	10.8	10.8	2.61	100.0	100.0	100.0	
(Direct)	-	10.8	11.2	2.24	-	-	-	
Table-1 Concentrate	17.4	33.2	24.9	4.55	53.6	40.0	25.8	0.91
Table-1 Tailing	23.8	13.1	12.0	3.44	28.9	26.3	26.6	
Spiral Conc. (Calc.)	41.2	21.6	17.5	3.91	82.5	66.3	52.4	
(Direct)	-	21.6	17.3	3.32	-	-	-	
Spiral Tailing	58.8	3.22	6.17	2.12	17.5	33.7	47.6	
Table-1 Tailing	23.8	13.1	12.0	3.44	28.9	26.3	26.6	
Minus 84 Mesh (Calc.)	82.6	6.07	7.85	2.50	46.4	60.0	74.2	
(Direct)	-	6.00	8.05	1.97	-	-	-	
Table-2 Concentrate	6.9	32.9	25.1	5.42	21.2	15.6	12.9	0.90
Table-2 Tailing	75.7	3.56	6.50	2.34	25.2	44.4	61.3	
Class. O/F (Calc.)	82.6	6.00	8.05	2.60	46.4	60.0	74.2	
(Direct)	-	6.00	8.05	1.97	-	-	-	
Cyclone Overflow	26.1	2.97	6.01	1.90	7.3	14.1	16.0	
Cyclone Underflow	49.6	3.87	6.82	2.83	18.0	30.4	45.3	
Table-2 Tail (Calc.)	75.7	3.56	6.54	2.51	25.2	44.4	61.3	
(Direct)	-	3.56	6.50	2.34	-	-	-	
Flotation Concentrate	8.7	10.8	10.9	2.57	8.8	8.5	7.2	
Flotation Tailing	40.9	2.39	5.92	2.38	9.2	21.7	31.4	
Cyclone U/F (Calc.)	49.6	3.87	6.80	2.41	18.0	30.4	45.3	
(Direct)	-	3.87	6.82	2.83	-	-	-	

Test 8B

Table-1 Concentrate	29.9	27.9	21.6	5.15	75.1	59.5	58.3	0.88
Spiral Tailing	70.1	3.94	6.27	1.57	24.9	40.5	41.7	
Minus 35 Mesh (Calc.)	100.0	11.1	10.9	2.64	100.0	100.0	100.0	
(Direct)	-	11.1	10.8	2.20	-	-	-	
Table-2 Concentrate	0.3	26.2	21.4	5.15	0.8	0.6	0.7	0.84
Table-2 Tailing	69.8	3.83	6.50	1.58	24.1	39.9	41.0	
Spiral Tail. (Calc.)	70.1	3.94	6.57	1.60	24.9	40.5	41.7	
(Direct)	-	3.94	6.27	1.57	-	-	-	
Cyclone Overflow	26.4	3.37	6.03	1.34	8.0	14.0	13.2	
Cyclone Underflow	43.4	4.11	6.79	1.80	16.1	25.9	29.1	
Table-2 Tail. (Calc.)	69.8	3.83	6.50	1.63	24.1	39.9	41.0	
(Direct)	-	3.83	6.50	1.58	-	-	-	
Flotation Concentrate	5.6	13.2	11.9	2.24	6.7	5.9	4.7	0.76
Flotation Tailing	37.7	2.75	5.57	1.54	9.3	18.5	21.6	
Cyclone U/F (Calc.)	43.4	4.11	6.39	1.63	16.1	25.9	29.1	
(Direct)	-	4.11	6.79	1.80	-	-	-	

Test No. 8 - Continued

3.6. Size Analyses:

Test 8A

Minus 1/4" Feed

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 3	0.3	0.3	99.7
4	19.0	19.3	80.7
6	14.5	33.8	66.2
8	11.9	45.7	54.3
10	7.8	53.5	46.5
14	7.4	60.9	39.1
20	4.7	65.6	34.4
28	5.0	70.6	29.4
35	4.4	75.0	25.0
48	5.2	80.2	19.8
65	4.4	84.6	15.4
- 65	15.4	100.0	-
Total	100.0	-	-

Minus 35 Mesh

+ 65	15.0	15.0	85.0
100	14.9	29.9	70.1
150	14.0	43.9	56.1
200	9.8	53.7	46.3
270	7.9	61.6	38.4
400	6.0	67.6	32.4
- 400	32.4	100.0	-
Total	100.0	-	-

Minus 84 Mesh

+ 100	5.3	5.3	94.7
150	11.6	16.9	83.1
200	10.1	27.0	73.0
270	7.6	34.6	65.4
400	7.5	42.1	57.9
- 400	57.9	100.0	-
Total	100.0	-	-

Test No. PP-8 - Continued

3.6. Size Analyses (Test 8A) - Cont'd

Cyclone Overflow

Particle Size	% Retained		% Passing Cumulative
	Individual	Cumulative	
+ 39.1 µm	0.1	0.1	99.9
30.3	0.3	0.4	99.6
21.1	1.2	1.6	98.4
14.5	3.2	4.8	95.2
11.2	2.8	7.6	92.4
- 11.2	92.4	100.0	-
Total	100.0	-	-

Specific Gravity 2.80

Test 8B

Minus 1/4" Feed

Mesh Size (Tyler)	% Retained		% Passing Cumulative
	Individual	Cumulative	
+ 3	0.8	0.8	99.2
4	21.7	22.5	77.5
6	15.2	37.7	62.3
8	11.4	49.1	50.9
10	8.1	57.2	42.8
14	7.4	64.6	35.4
20	4.4	69.0	31.0
28	4.7	73.7	26.3
35	4.0	77.7	22.3
48	4.6	82.3	17.7
65	4.0	86.3	13.7
- 65	13.7	100.0	-
Total	100.0	-	-

Cyclone Underflow

+ 100	6.3	6.3	93.7
150	16.0	22.3	77.7
200	14.6	36.9	63.1
270	11.3	48.2	51.8
400	10.6	58.8	41.2
- 400	41.2	100.0	-
Total	100.0	-	-

Test No. PP-8 - Continued

3.6. Size Analyses (Test 8B) - Cont'd

Minus 35 Mesh

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 48	2.8	2.8	97.2
65	9.5	12.3	87.7
100	13.0	25.3	74.7
150	14.1	39.4	60.6
200	10.9	50.3	49.7
270	8.9	59.2	40.8
400	6.8	66.0	34.0
- 400	34.0	100.0	-
Total	100.0	-	-

Cyclone Overflow

Particle Size	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 38.9 μm	0.2	0.2	99.8
30.1	0.3	0.5	99.5
21.0	1.6	2.1	97.9
14.5	3.7	5.8	94.2
11.2	3.3	9.1	90.9
- 11.2	90.9	100.0	-
Total	100.0	-	-

Specific Gravity 2.82

Test No. PP-9 **Non-Magnetics**

1. Purpose: To investigate the response of the non-magnetic fraction from preconcentration testwork to the developed flowsheets.

2. Method: The circuit was operated for 7 hours at a feed rate of 75 kg/h and two sample periods were conducted.

9A - From 2-3 1/2 hours into run - Flowsheet Test 7 with Table-1 tailing recirculated to gravit rougher feed.

9B - From 5 1/2-7 hours into run - Flowsheet Test 6 with Table-1 tailing not recirculated.

3. Results:

3.1. Reagent Additions

Reagent	Point of Add'n	Amount kg/t 9A	Amount kg/t 9B
Armac C	Conditioner	0.54	0.54
H_2SO_4	Conditioner	12.1	14.9
H_2SO_4	1st Cleaner	2.6	2.4

3.2. Pulp Densities

	9A	9B	% Solids 9A	% Solids 9B
Rod Mill Discharge	1785g/L	1795g/L	66	67
Spiral Tailing	1200	1165	25	21
Ball Mill Discharge	1440	1275	46	33
Minus 80 Mesh	1185	1090	24	13
Table Tailing	1060	1065	9	9
Cyclone Overflow	1010	1015	2	2
Cyclone Underflow	1140	1175	19	23

3.3. pH

	9A	9B
Rougher	2.7	2.4
1st Cleaner	2.2	2.3
2nd Cleaner	2.7	2.5

3.4. Chemical Analyses

Product	Test 9A Cr_2O_3	Test 9A Fe	Test 9A Mag Fe	Test 9B Cr_2O_3	Test 9B Fe	Test 9B Mag Fe
Minus 35 Mesh	9.82	9.93	2.25	6.57	8.1	2.10
Spiral Conc.	-	-	-	20.9	16.9	3.69
Spiral Tail.	2.57	5.71	1.65	2.03	5.30	1.59
Table-1 Conc.	31.9	24.2	4.96	32.8	25.7	5.91
Table-1 Tail.	-	-	-	11.4	10.8	2.62
Minus 84 Mesh	2.49	5.63	1.59	3.53	6.18	1.78
Table-2 Conc.	19.5	18.9	6.02	34.6	24.6	4.70
Table-2 Tail.	2.22	5.51	1.50	3.00	5.94	1.77
Cyclone O/F	1.95	5.12	1.27	2.31	5.24	1.25
Cyclone U/F	2.34	5.60	1.63	3.22	6.11	1.87
Flotation Conc.	8.27	8.68	3.56	8.54	7.84	1.26
Flotation Tail.	2.18	5.40	1.45	2.36	5.41	1.60

Test No. PP-9 - Continued

3.5. Metallurgical Results

Test 9A

Product	Weight %	Assays %			% Distribution			Ratio Cr:Fe
		Cr_2O_3	Fe	Mag Fe	Cr_2O_3	Fe	Mag Fe	
Table-1 Concentrate	24.7	31.9	24.2	4.96	80.3	58.2	49.7	0.90
Spiral Tailing	75.3	2.57	5.71	1.65	19.7	41.8	50.3	
Minus 35 Mesh (Calc.)	100.0	9.82	10.3	2.47	100.0	100.0	100.0	
(Direct)	-	9.82	9.93	2.26	-	-	-	
Table-2 Concentrate	1.5	19.5	18.9	6.02	3.0	2.8	3.9	0.71
Table-2 Tailing	73.8	2.22	5.51	1.50	16.7	39.0	46.5	
Spiral Tail. (Calc.)	75.3	2.57	5.78	1.59	19.7	41.8	50.3	
(Direct)	-	2.57	5.71	1.65	-	-	-	
Cyclone Overflow	22.7	1.95	5.12	1.27	4.5	11.2	12.1	0.26
Cyclone Underflow	51.1	2.34	5.60	1.63	12.2	27.5	35.0	
Table-2 Tail. (Calc.)	73.8	2.22	5.45	1.52	16.7	39.0	46.5	
(Direct)	-	2.22	5.51	1.50	-	-	-	
Flotation Concentrate	1.3	8.27	8.68	3.56	1.1	1.1	2.0	0.65
Flotation Tailing	49.7	2.18	5.40	1.45	11.0	25.9	30.3	
Cyclone U/F (Calc.)	51.1	2.34	5.49	1.51	12.2	27.5	35.0	
(Direct)	-	2.34	5.60	1.63	-	-	-	

Test No. 9 - Continued

3.5. Metallurgical Results - Cont'd

Test 9B

Product	Weight %	Assays %			% Distribution			Ratio Cr:Fe
		Cr_2O_3	Fe	Mag Fe	Cr_2O_3	Fe	Mag Fe	
Spiral Concentrate	24.1	20.9	16.9	3.59	76.5	50.3	42.4	0.85
Spiral Tailing	75.9	2.03	5.30	1.59	23.5	49.7	57.6	
Minus 35 Mesh (Calc.)	100.0	6.57	8.1	2.10	100.0	100.0	100.0	
(Direct)	-	6.57	8.2	2.18	-	-	-	
Table-1 Concentrate	10.7	32.8	25.7	5.91	53.3	32.9	27.2	0.87
Table-1 Tailing	13.4	11.4	10.8	2.62	23.2	17.3	15.1	
Spiral Conc. (Calc.)	24.1	20.9	17.4	4.08	76.5	50.3	42.4	
(Direct)	-	20.9	16.9	3.69	-	-	-	
Spiral Tailing	75.9	2.03	5.30	1.59	23.5	49.7	57.6	
Table-1 Tail.	13.4	11.4	10.8	2.62	23.2	17.3	15.1	
Minus 84 Mesh (Calc.)	89.3	3.43	6.12	1.74	46.7	67.1	72.8	
(Direct)	-	3.53	6.18	1.78	-	-	-	
Table-2 Concentrate	1.5	34.6	24.6	4.70	7.7	4.4	3.2	0.96
Table-2 Tailing	87.8	3.00	5.94	1.77	39.0	62.7	69.6	
Class. O/F (Calc.)	89.3	3.53	6.25	1.82	46.7	67.1	72.8	
(Direct)	-	3.53	6.18	1.78	-	-	-	
Cyclone Overflow	21.2	2.31	5.25	1.25	7.3	13.5	12.2	
Cyclone Underflow	66.6	3.22	6.11	1.87	31.7	49.2	57.4	
Table-2 Tail. (Calc.)	87.8	3.00	5.90	1.72	39.0	62.7	69.6	
(Direct)	-	3.00	5.94	1.77	-	-	-	
Flotation Concentrate	9.3	8.54	7.84	1.26	11.7	8.8	5.4	
Flotation Tailing	57.3	2.36	5.41	1.60	20.0	37.5	42.3	
Cyclone U/F (Calc.)	66.6	3.22	5.75	1.55	31.7	49.2	57.4	
(Direct)	-	3.22	6.11	1.87	-	-	-	

3.6. Size Analyses:

Test 9A

Minus 84 Mesh

Mesh Size (Tyler)	% Retained		% Passing Cumulative
	Individual	Cumulative	
+ 65	4.0	4.0	96.0
100	6.0	10.0	90.0
150	10.4	20.4	79.6
200	8.9	29.3	70.7
270	6.9	36.2	63.8
400	7.0	43.2	56.8
- 400	56.8	100.0	-
Total	100.0	-	-

Test No. PP-9 - Continued

3.6. Size Analyses (Test 9A) - Cont'd

Minus 35 Mesh

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 48	6.2	6.2	93.8
65	15.6	21.8	78.2
100	16.3	38.1	61.9
150	12.8	50.9	49.1
200	9.0	59.9	40.1
270	6.8	66.7	33.3
400	5.4	72.1	27.9
- 400	27.9	100.0	-
Total	100.0	-	-

Cyclone Overflow

Particle Size	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 39.3 μm	0.2	0.2	99.8
30.4	0.2	0.4	99.6
21.2	0.9	1.3	98.7
14.6	2.6	3.9	96.1
11.3	2.7	6.6	93.4
- 11.3	93.4	100.0	-
Total	100.0	-	-

Specific Gravity 2.78

Test No. PP-9 - Continued

3.6. Size Analyses - Cont'd

Test 9B

Rod Mill Feed

Mesh Size (Tyler)	% Retained		% Passing
	Individual	Cumulative	Cumulative
+ 3	2.0	2.0	98.0
4	40.6	42.5	57.4
6	23.8	66.4	33.6
8	11.1	77.5	22.5
10	6.0	83.5	16.5
14	3.8	87.3	12.7
20	1.6	88.9	11.1
28	1.4	90.3	9.7
35	1.0	91.3	8.7
48	1.1	92.4	7.6
65	0.8	93.2	6.8
- 65	6.8	100.0	-
Total	100.0	-	-

Cyclone Underflow

+ 20	0.1	0.1	99.9
28	0.1	0.2	99.8
35	0.3	0.5	99.5
48	0.9	1.4	98.6
65	2.3	3.7	96.3
100	4.4	8.1	91.9
150	10.0	18.1	81.9
200	18.7	36.8	63.2
270	22.4	59.2	40.8
400	21.1	80.3	19.7
- 400	19.7	100.0	-
Total	100.0	-	-

Test No. PP-9 - Continued

3.6. Size Analyses (Test 9B) - Cont'd

Minus 35 Mesh

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 48	7.3	7.3	92.7
65	13.7	21.0	79.0
100	14.5	35.5	64.5
150	12.0	47.5	52.5
200	8.6	56.1	43.9
270	6.7	62.8	37.2
400	5.7	68.5	31.5
- 400	31.5	100.0	-
Total	100.0	-	-

Minus 84 Mesh

+ 100	5.7	5.7	94.3
150	12.9	18.6	81.4
200	11.0	29.6	70.4
270	8.4	38.0	62.0
400	8.0	46.0	54.0
- 400	54.0	100.0	-
Total	100.0	-	-

Cyclone Overflow

Particle Size	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 38.5 µm	0.1	0.1	99.9
29.8	0.2	0.3	99.7
20.8	1.1	1.4	98.6
14.3	3.0	4.4	95.6
11.1	2.9	7.3	92.7
- 11.1	92.7	100.0	-
Total	100.0	-	-

Specific Gravity 2.84

Test No. PP-10

Purpose: To investigate preconcentration of the ore by heavy media separation and to investigate the recovery of chromite from an accept composite by gravity separation.

Heavy Media Preconcentration

Procedure: The Tri-Flow TFS 150 circuit as operated at Lakefield Research is shown in the diagram.

The media consisted of a mixture of ferrosilicon (Hoechst Cyclone 40) and magnetite (minus 200 mesh). The initial adjustments to the media density were made whilst recycling the media directly through the media tank. Final adjustments and measurements were made with the Tri-Flo separator in the circuit. With the media operating as required, approximately 25 kg of minus 6 mm plus 30 mesh ore was fed into the separator within a time period of 5 to 10 minutes. The oversize products from the DSM screens were collected on secondary screens and washed at leisure.

One half of each product was riffled out, crushed, re-riffled, pulverized and submitted for assay.

Feed: -6mm +30 mesh ore

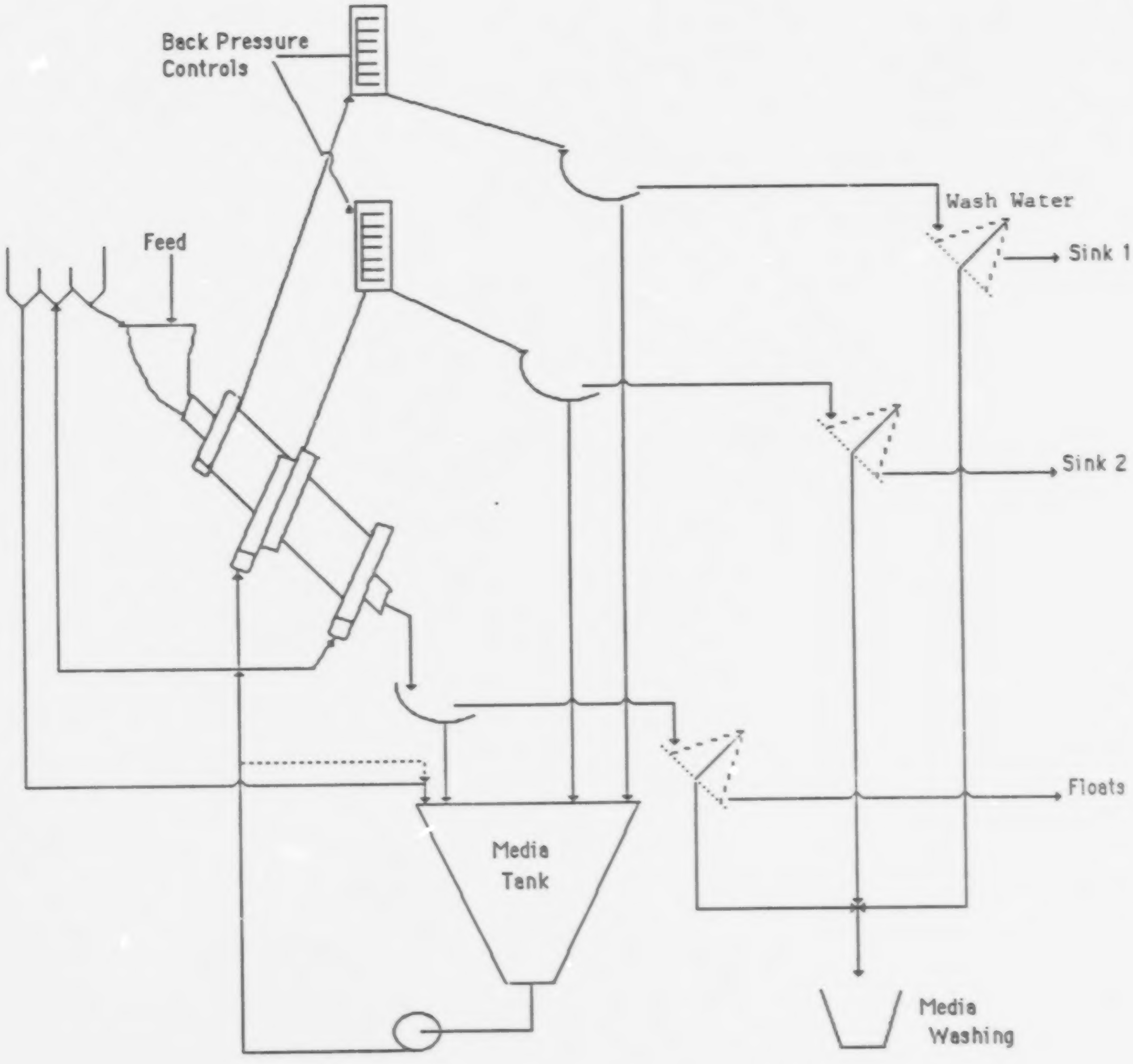
The −6 mm ore was screened at 30 mesh.

The minus 30 mesh product was sampled and assayed.

Product	Weight %
-6mm + 30 Mesh	84.7
-30 Mesh	15.3
	100.0

Test No. PP-10 - Continued

Tri-Flow Separator


Back Pressure Controls
Feed
Wash Water
Sink 1
Sink 2
Floats
Media Tank
Media Washing

Test No. PP-10 - Continued

Operating Data

Test No.	Media Densities, g/L					Gauge Pressure, psi				Media
	Feed	Sink 1	Sink 2	Float	Δ S1-F	Sink 1		Sink 2		% Fe Si
						1	2	1	2	
TF1	3020	3160	3255	2690	470	45	45	NA	34	67
TF2	2955	3165	3330	2525	640	43	43	NA	32.5	67
TF3	2875	3120	3340	2455	665	42	41.5	NA	31	67
TF4	2680	3045	3290	2150	895	39	40	NA	30	67
TF5	2620	3035	3235	2050	985	32	32	NA	24	67
TF6	2570	2990	3240	1960	1030	35	35	NA	26.5	67

NA - Not Available

TEST NO. TF 1
SIZE : -1/4 " + 30 Mesh

PRODUCT	WEIGHT		ASSAYS %			% DISTRIBUTION		
	g	%	Cr_2O_3	Fe(T)	Fe(M)	Cr_2O_3	Fe(T)	Fe(M)
Sink 1	6000	24.39	21.70	18.70	6.13	67.01	40.23	31.43
Sink 2	2700	10.98	12.90	13.40	4.34	17.93	12.97	10.01
Float	15900	64.63	1.84	8.21	4.31	15.06	46.80	58.56
Head (Calc.)	24600	100.00	7.90	11.34	4.76	100.00	100.00	100.00
COMBINED PRODUCTS								
Sink 1+2	8700	35.37	18.97	17.06	5.57	84.94	53.20	41.44
Sink 2 + Float	18600	75.61	3.45	8.96	4.31	32.99	59.77	68.57

TEST NO. TF 2
SIZE : -1/4 " + 30 Mesh

PRODUCT	WEIGHT		ASSAYS %			% DISTRIBUTION		
	g	%	Cr_2O_3	Fe(T)	Fe(M)	Cr_2O_3	Fe(T)	Fe(M)
Sink 1	5400	22.13	15.70	15.40	5.16	57.11	33.54	26.35
Sink 2	1800	7.38	15.50	15.20	5.04	18.79	11.03	8.58
Float	17200	70.49	2.08	7.99	4.00	24.10	55.43	65.07
Head (Calc.)	24400	100.00	6.08	10.16	4.33	100.00	100.00	100.00
COMBINED PRODUCTS								
Sink 1+2	7200	29.51	15.65	15.35	5.13	75.90	44.57	34.93
Sink 2 + Float	19000	77.87	3.35	8.67	4.10	42.89	66.46	73.65

TEST NO. TF 3
SIZE : -1/4 " + 30 Mesh

PRODUCT	WEIGHT		ASSAYS %			% DISTRIBUTION		
	g	%	Cr_2O_3	Fe(T)	Fe(M)	Cr_2O_3	Fe(T)	Fe(M)
Sink 1	1800	9.05	23.80	16.90	3.48	38.10	15.81	7.54
Sink 2	1800	9.05	17.30	16.20	5.34	27.69	15.15	11.58
Float	16300	81.91	2.36	8.150	4.12	34.21	69.04	80.88
Head (Calc.)	19900	100.00	5.65	9.67	4.17	100.00	100.00	100.00
COMBINED PRODUCTS								
Sink 1+2	3600	18.09	20.55	16.55	4.41	65.79	30.96	19.12
Sink 2 + Float	18100	90.95	3.85	8.95	4.24	61.90	84.19	92.46

TEST NO. TF 4
SIZE : -1/4 " + 30 Mesh

PRODUCT	WEIGHT		ASSAYS %			% DISTRIBUTION		
	g	%	Cr203	Fe(T)	Fe(M)	Cr203	Fe(T)	Fe(M)
Sink 1	3600	17.22	20.70	14.80	2.77	61.81	27.18	12.46
Sink 2	2300	11.00	9.45	12.30	4.90	18.03	14.43	14.08
Float	15000	71.77	1.62	7.63	3.92	20.16	58.39	73.46
Head (Calc.)	20900	100.00	5.77	9.38	3.83	100.00	100.00	100.00
COMBINED PRODUCTS								
Sink 1+2	5900	28.23	16.31	13.83	3.60	79.84	41.61	26.54
Sink 2 + Float	17300	82.78	2.66	8.25	4.05	38.19	72.82	87.54

TEST NO. TF 5
SIZE : -1/4 " + 30 Mesh

PRODUCT	WEIGHT		ASSAYS %			% DISTRIBUTION		
	g	%	Cr203	Fe(T)	Fe(M)	Cr203	Fe(T)	Fe(M)
Sink 1	7700	37.02	12.40	12.60	3.92	78.91	49.37	37.73
Sink 2	900	4.33	9.91	12.40	4.66	7.37	5.68	5.24
Float	12200	58.65	1.36	7.24	3.74	13.71	44.95	57.03
Head (Calc.)	20800	100.00	5.82	9.45	3.85	100.00	100.00	100.00
COMBINED PRODUCTS								
Sink 1+2	8600	41.35	12.14	12.58	4.00	86.29	55.05	42.97
Sink 2 + Float	13100	62.98	1.95	7.59	3.80	21.09	50.63	62.27

TEST NO. TF 6
SIZE : -1/4 " + 30 Mesh

PRODUCT	WEIGHT		ASSAYS %			% DISTRIBUTION		
	g	%	Cr203	Fe(T)	Fe(M)	Cr203	Fe(T)	Fe(M)
Sink 1	30400	47.20	9.53	11.60	4.18	79.18	58.19	51.72
Sink 2	7700	11.96	6.24	10.30	4.34	13.13	13.09	13.60
Float	26300	40.84	1.07	6.62	3.24	7.69	28.73	34.68
Head (Calc.)	64400	100.00	5.68	9.41	3.82	100.00	100.00	100.00
COMBINED PRODUCTS								
Sink 1+2	38100	59.16	8.87	11.34	4.21	92.31	71.27	65.32
Sink 2 + Float	34000	52.80	2.24	7.45	3.49	20.82	41.81	48.28

Test No. PP-10 - Continued

Overall Results

Test No.	Product	Weight %	Assays, %			% Distribution		
			Cr_2O_3	Fe	Mag Fe	Cr_2O_3	Fe	Mag Fe
TF1	Sink 1	20.7	21.7	18.7	6.13	53.9	34.2	28.4
	Sink 2	9.3	12.9	13.4	4.34	14.4	11.0	9.1
	Float	54.7	1.84	8.21	4.31	12.1	39.7	52.9
	-30 Mesh	15.3	10.7	11.2	2.79	19.6	15.1	9.6
	Accept*	45.3	16.2	15.1	4.63	87.9	60.3	47.1
	Head		8.33	11.3	4.46			
TF5	Sink 1	31.3	12.4	12.6	3.92	59.2	40.6	33.3
	Sink 2	3.7	9.91	12.4	4.66	5.6	4.7	4.7
	Float	49.7	1.36	7.24	3.74	10.3	37.0	50.4
	-30 Mesh	15.3	10.7	11.2	2.79	24.9	17.7	11.6
	Accept*	50.3	11.7	12.2	3.63	89.7	63.0	49.6
	Head		6.56	9.72	3.69			
TF6	Sink 1	40.0	9.53	11.6	4.18	59.1	47.9	45.7
	Sink 2	10.1	6.24	10.3	4.34	9.8	10.7	12.0
	Float	34.6	1.07	6.62	3.24	5.7	23.7	30.6
	-30 Mesh	15.3	10.7	11.2	2.79	25.4	17.7	11.7
	Accept*	65.4	9.31	11.3	3.88	94.3	76.3	69.4
	Head		6.54	9.68	3.66			

* The accept composite included the sink fractions and minus 30 mesh material

A 4 kg accept composite was prepared from TF-5 products to investigate upgrading by gravity separation.

Gravity Separation

The composite was stage ground to minus 30 mesh in the laboratory rod mill. It was then fed to a Wilfley table with middling recirculation. The table concentrate was fed to the Jeffrey permanent drum magnetic separator operating at 1.0A. The non-mags were repassed at 2.5A. The table middlings and tailings were combined and reground to minus 100 mesh by stage grinding. The -100 mesh product was tabled and the table concentrate cleaned by magnetic separation similarly to the -30 mesh feed.

Feed: 2.49 kg TF5 Sink 1
0.29 kg TF5 Sink 2 } Accept Composite
1.22 kg -30 mesh ore

Test No. PP-10 - Continued

Metallurgical Results

Product	Weight %		Assays, %			Cr/Fe	% Distribution					
			Cr_2O_3	Fe	Mag		Cr_2O_3		Fe		Mag Fe	
	Ind.	O'all					Ind.	O'all	Ind.	O'all	Ind.	O'all
1. -30M Non-Mags	17.63	8.87	33.2	20.0	1.17	1.14	51.3	46.0	29.0	18.3	5.3	2.6
2. -30M 2A Mags	1.58	0.79	27.9	28.6	9.92		3.9	3.5	3.7	2.3	4.1	2.0
3. -30M 1A Mags	4.54	2.28	19.3	38.2	24.0		7.7	6.9	14.3	9.0	28.1	13.9
4. -100M Non-Mags	3.70	1.86	33.0	20.9	2.35	1.08	10.7	9.6	6.4	4.0	2.3	1.2
5. -100M 2A Mags	0.21	0.11	21.2	33.5	17.7		0.4	0.3	0.6	0.4	1.0	0.5
6. -100M 1A Mags	0.91	0.46	15.6	41.3	29.1		1.2	1.1	3.1	2.0	6.8	3.4
7. -100M Table Midd.	13.59	6.84	9.97	11.5	3.79		11.8	10.6	12.9	8.1	13.3	6.6
8. -100M Table Tail.	57.84	29.09	2.56	6.31	2.62		13.0	11.7	30.0	18.9	39.1	19.4
Head (Calculated)	100.0	50.3	11.4	12.1	3.89	-	100.0	89.7	100.0	63.0	100.0	49.6

Calculated Grades and Recoveries

-30M 1A Non-Mags(1+2)	19.21	9.66	32.8	20.7	1.89	1.08	55.2	49.5	32.7	20.6	9.4	4.6
-30M Table Conc(1-3)	23.75	11.94	30.2	24.0	6.12	0.86	62.9	56.4	47.0	29.6	37.5	18.5
-100M 1A Non-Mags(4+5	3.91	1.97	32.4	21.6	3.18	1.03	11.1	9.9	7.0	4.4	3.3	1.7
-100M Table Conc(4-6)	4.82	2.43	29.2	25.3	8.07	0.79	12.3	11.0	10.1	6.4	10.1	5.1
Comb Table Concs(1-6)	28.57	14.37	30.0	24.3	6.45	0.84	75.2	67.4	57.1	36.0	47.6	23.6
Comb Non-Mags(1+4)	21.33	10.73	33.2	20.2	1.38	1.12	62.0	55.6	35.4	22.3	7.6	3.8

Bond Work Index Test

Mesh of Grind: -6 Mesh   Feed: 10.3 % Passing 100 Mesh

Cycle	New Feed g	Number of Revolutions	Grams of Minus 100 Mesh			
			In Mill Product	In Mill Feed	Net Product	Net Per Revolution
1	1308.5	150	283.5	134.8	148.7	0.99
2	283.5	348	349.4	29.2	320.2	0.92
3	349.4	367	360.7	36.0	324.7	0.88
4	360.7	383	394.5	37.2	357.3	0.93
5	394.5	359	350.7	40.6	310.1	0.86

Unit Volume (700 mL) = 1308.5 g in mill :Equivalent to 1869 kg/m^3 at minus 6 mesh

Ideal potential product = 373.9 g

Average of last 2 periods : 372.6 g : 351 % circulating load
: 0.90 net g minus 100 mesh per revolution

Bonds Formula

$$W_i = 44.5 / (P_1)^{0.23} \times (Gbp)^{0.82}\left(\frac{10}{\sqrt{P}} - \frac{10}{\sqrt{F}}\right)$$

Where:

W_i = Work Index = 20.75
P_1 = Screen size test in microns = 147
Gbp = Net grams of undersize produced per revolution of test mill = 0.90
P = Size in microns which 80 percent of test product passes = 109
F = Size in microns which 80 percent of test feed passes = 2149

Bond Work Index Test - Continued

Screen Analyses

-6 Mesh Feed

Mesh Size (Tyler)	% Retained Individual	 Cumulative	% Passing Cumulative
+ 6	0.4	0.4	99.6
8	19.9	20.3	89.7
10	19.4	39.7	60.3
14	15.4	55.1	44.9
20	9.1	64.2	35.8
28	6.8	71.0	29.0
35	5.6	76.6	23.4
48	5.7	82.3	17.7
65	4.2	86.5	13.5
100	3.2	89.7	10.3
150	3.0	92.7	7.3
200	1.8	94.5	5.5
270	1.1	95.6	4.4
400	1.1	96.7	3.3
- 400	3.3	100.0	-
Total	100.0	-	-

100 Mesh Undersize

+ 100	0.8	0.8	99.2
150	20.4	21.2	78.8
200	16.5	37.7	62.3
270	10.6	48.3	51.7
400	9.2	57.5	42.5
- 400	42.5	100.0	-
Total	100.0	-	-

Bond Work Index Test - Continued

Screen Analyses

100 Mesh Oversize

Mesh Size (Tyler)	% Retained Individual	% Retained Cumulative	% Passing Cumulative
+ 6	0.1	0.1	99.9
8	20.3	20.4	79.6
10	21.5	41.9	58.1
14	16.2	58.1	41.9
20	7.7	65.8	34.2
28	5.1	70.9	29.1
35	4.3	75.2	24.8
48	6.0	81.2	18.8
65	7.3	88.5	11.5
100	8.0	96.5	3.5
- 100	3.5	100.0	-
Total	100.0	-	-

LAKEFIELD RESEARCH
A Division of Falconbridge Limited
Lakefield, Ontario
December 10, 1986 / slk, sem

ORE SORTERS (CANADA) LIMITED

TESTWORK REPORT
FOR
SAMPLE NO. 556,561
CHROMITE ORE MANITOBA
PROJECT 3122
LAKEFIELD RESEARCH

Date: June 27, 1986

1. INTRODUCTION

Lakefield Research forwarded a series of samples from a Chromite deposit in Manitoba to establish whether the run of mine ore can be preconcentrated by use of ore sorting and how effectively this can be done.

The first sample tested was approximately 27 kilograms of ore. Preliminary work was carried out to identify the ore and waste and make use of the properties of each to establish a sorting criteria. Examination of the sample suggested that the most effective sorting criteria would be use of the magnetic properties of the waste.

The waste material contained a higher percentage of magnetite than the product. It became apparent that the chrome content was inversley proportional to magnetite content as seen in assays which are included in this report.

Using magnetic intensity as the sorting criteria would not produce a clean product/waste separation because within a rock containing chromite, there may also be magnetite which would be sensed as waste. For this reason it was best to conduct the testwork in the manner it was, using decreasing cut off levels to provide several separated fractions out of the sample to provide a meaningful table of results.

Once the preliminary testwork was completed to verify that magnetic sensing could separate the chromite bearing material from thewaste material, further testwork was conducted on the ore.

Next a test program was carried out to sort three size ranges separately on the M27 Conductivity/Magnetic Response Sorter, these being +1" -2", +2" -4", +4" -6".

These samples were selected and screened at Lakefield Research in preparation for sorting at OSC.

The necessary processingand mechanical adjustments were made to best accomodate each size range of material. First the +1" -2" material was sorted to arrive at the sample fractions labelled 556 A-1 to 556 A-5. Next the +2" -4" material was sorted to arrive at the sample fractions 556B-1 to 556 B-5. The +4" -6" fraction was slightly on the large size for the mechanical handling capacity of the M-27. Therefore, the material was laid out and the oversize material was hand selected out and set aside as too large (123 lbs).

The remaining portion of the +4" -6" material was run through the M27 sorter to arrive at the sorted fraction 556C-1 to 556C-4. Each fraction was labelled and weighed at OSC then sent to Lakefield Research for analysis. From this data, a table of results was calculated by Lakefield Research for each individual size range.

Ore Sorters Report - Cont'd

Also, Feed vs. Recovery Graphs were compiled for each size range as well as a histogram of sorting results for each size range.

On June 4, 1986, approximately 900 lbs of +3/4" -2" chromite ore was delivered to Ore Sorters Canada, contained in two 45 gallon drums. The purpose of sorting this material was to determine what recovery could be expected in the area of 25 - 50 % of the original feed accepted.

In order to keep the tests standard sized, the material was screened on a 1" screen to produce a +1" -2" sorting size while the +3/4" -1" was returned to Lakefield Research unsorted. A table of results, along with a flow diagram, explains the test procedure followed for the +1" -2" material.

PRELIMINARY TESTWORK CARRIED OUT ON
27 KILOGRAM SAMPLE OSC # 556.
SAMPLE SORTED INTO FRACTIONS 3122-A
MAY 8/86 3122-B
SEE TABLE #1 3122-C
& GRAPH #1 3122-D
3122-E.

FOLLOW UP TEST WORK CONDUCTED ON
THREE SIZE RANGES. +1"-2", +2"-4", +4"-6".
SORTED ON MAY 14, 15 /86
SAMPLE FRACTIONS DERIVED. 556 A-1 TO 556A-5. +1"-2
SEE TABLE #2, a, b. 556 B-1 TO 556B-5 +2"-4"
GRAPH #2, 3, 4, 5a, b, 6a, b, 7a, b 556 C-1 TO 556C-4 +4"-6"
ALSO OVERSIZE FRACTION 123 lbs.

TEST WORK CARRIED OUT ON +3/4"-2" MATERIAL
WHICH ARRIVED JUNE 5/86. SORTED JUNE 6/86.
SAMPLE FRACTIONS DERIVED 561 A-1 TO 561 A-7
ALSO +3/4"-1" UNSORTED FRACTION.
SEE. FLOWSHEET #1
TABLE # 3a, 3b.
GRAPH # 8
ASSAY SHEET

MAY /86

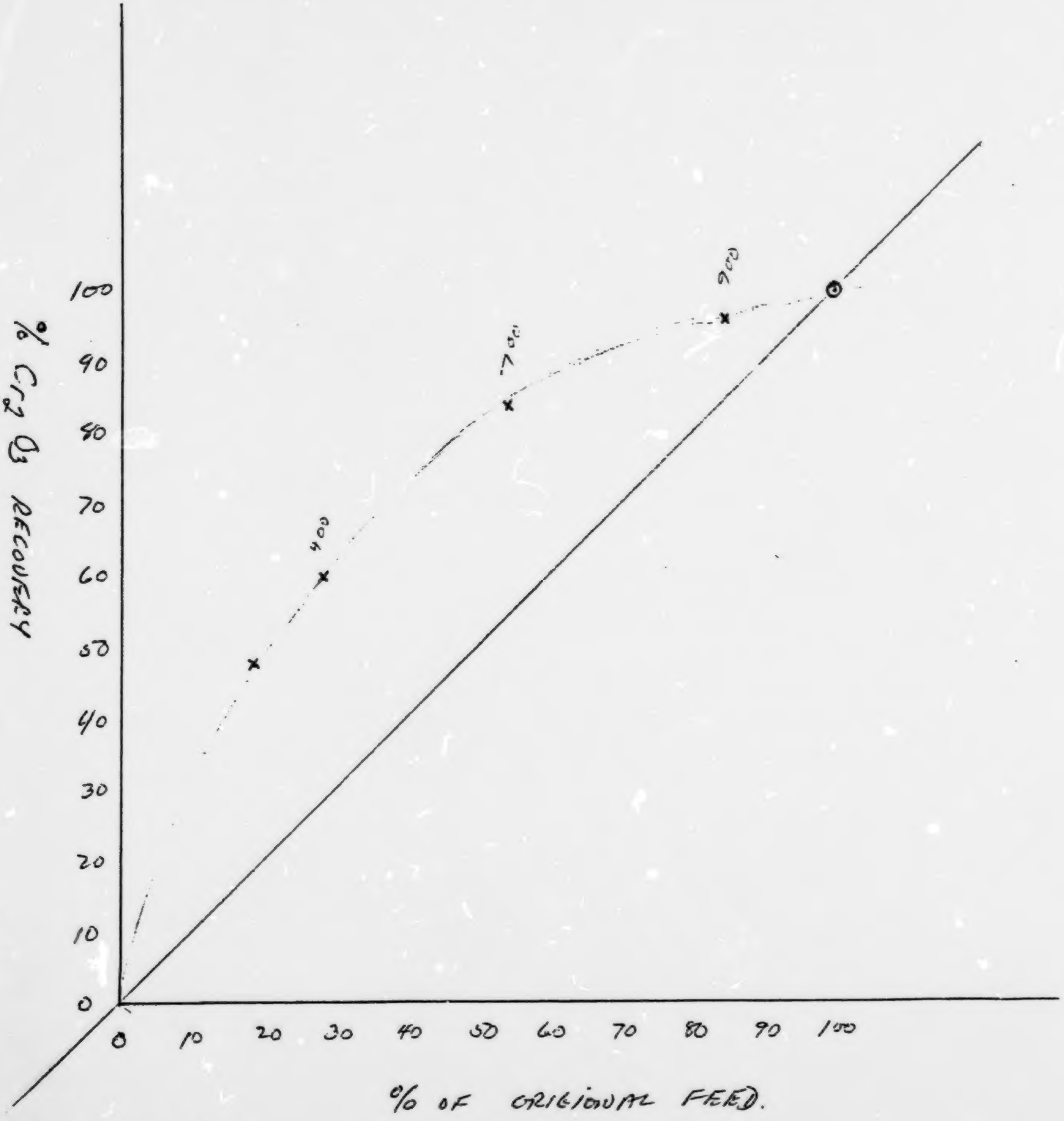
TEST WORK RESULTS
ιυ SAMPLE # 556 O.S.C , INITIAL SAMPLE
ROJ # 3122 LAKEFIELD RESEARCH.

TION	SIZE	WT (Kg)	% WT. ts	cum % WT.	ASSAY. % Cr_2O_3	WT. INC	% Cr_2O_3 IN SAMPLE
1 - A	1" - 2"	4.125	15.32	15.32	1.94	0.297	4.75
- B	1" - 2"	8.163	30.33	45.65	2.50	0.758	12.11
- C	1" - 2"	7.143	26.54	72.19	5.49	1.457	23.28
- D	1" - 2"	2.648	9.84.	82.03	8.28	0.815	13.02
- E.	1" - 2"	4.839.	17.98	100.01	16.30	2.931	46.84.
		26.918	100.00			6.258	

% Cr_2O_3.	% Cr_2O_3	in % FEED.	HEAD GRD.		FRACTION
4.75	100.0	100.0.	6.258.		A + B + C + D + E
12.11	95.25	84.68	7.039		B + C + D + E
23.28	83.14.	54.35	9.573	50% upgrading	C + D + E
13.02.	59.86.	27.81	13.470		D + E
46.84.	46.84	17.98	16.303		E

100.00.

RECOVERY VS FEED GRAPH.
OF PRELIMINARY TEST RESULTS
ON M-27.

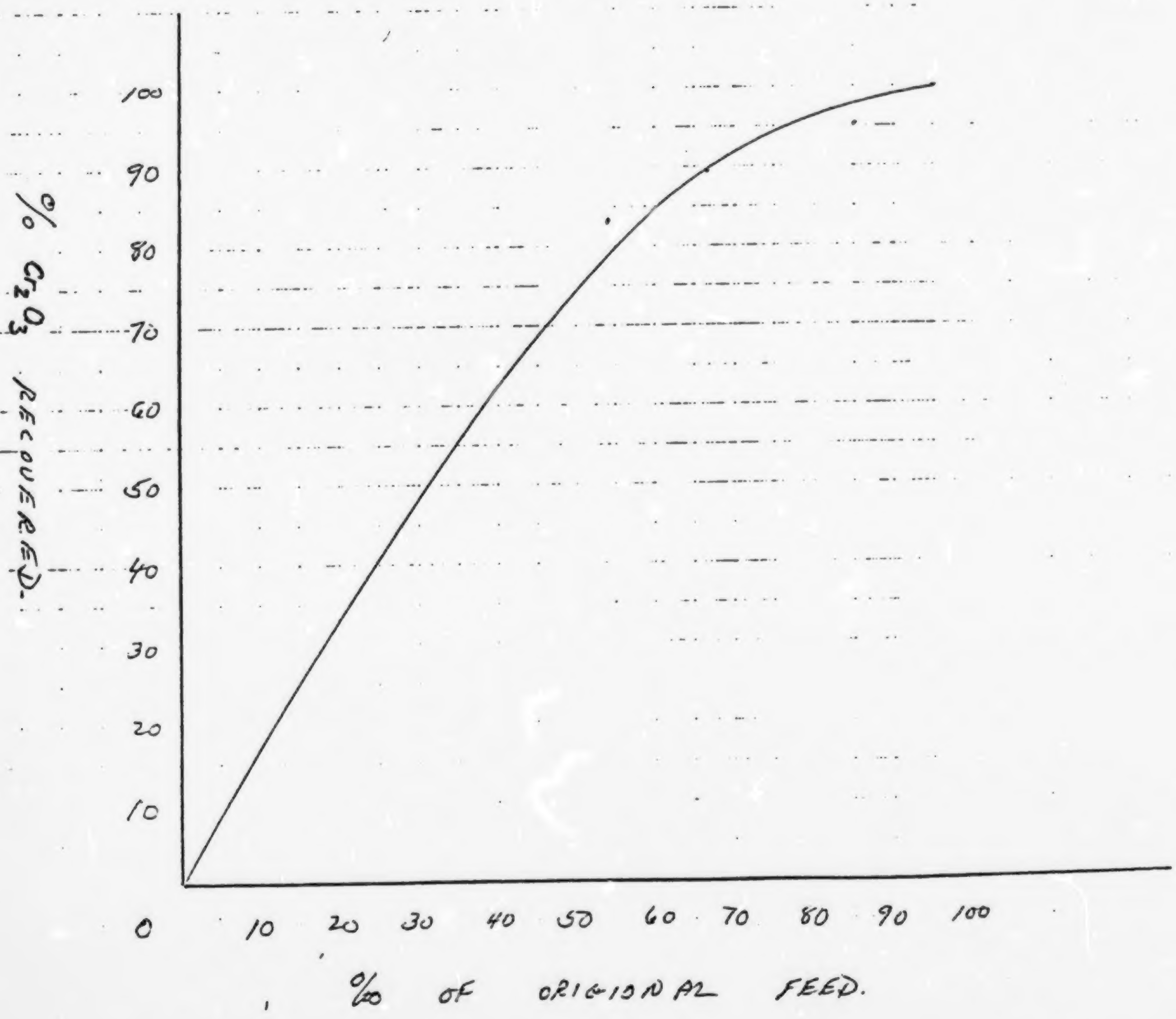


SAMPLE NO. : COMPOSITE
SIZE FRACTION : minus 6 inch

PRODUCT		WEIGHT Kg	WEIGHT % IND.	WEIGHT % O'ALL	ASSAY % Cr203	ASSAY % Fe	ASSAY % Mag Fe	% DISTRIBUTION (Ind.) Cr203	% DISTRIBUTION (Ind.) Fe	% DISTRIBUTION (Ind.) Mag Fe	% DISTRIBUTION (Overall) Cr203	% DISTRIBUTION (Overall) Fe	% DISTRIBUTION (Overall) Mag Fe
-6 +4 Inch	C-1	84	19.4	5.7	1.24	9.00	5.10	2.8	17.6	32.2	1.0	5.4	8.8
	C-2	47	10.9	3.2	1.93	8.54	4.73	2.5	9.3	16.7	0.9	2.9	4.6
	C-3	62	14.4	4.2	4.16	9.00	3.42	7.1	13.0	16.0	2.5	4.0	4.3
	C-4	239	55.3	16.2	13.4	10.8	1.95	87.6	60.1	35.1	31.4	18.4	9.5
-6 +4 Inch	(Comb.)	432	100.0	29.2	8.46	9.95	3.08	100.0	100.0	100.0	35.8	30.6	27.2
-4 +2 Inch	B-1	61	9.3	3.5	1.55	9.42	5.57	2.2	9.1	14.4	0.8	3.5	5.9
	B-2	112	17.2	6.5	1.49	9.29	5.19	3.9	16.4	24.6	1.4	6.3	10.2
	B-3	117	17.9	6.8	1.99	8.96	4.76	5.5	16.5	23.6	1.9	6.4	9.7
	B-4	350	53.6	20.2	10.5	10.2	2.44	86.4	56.3	36.1	30.8	21.7	14.9
	B-5	13	1.9	0.7	6.63	8.58	2.56	2.0	1.7	1.4	0.7	0.7	0.6
-4 +2 Inch	(Comb.)	653	100.0	37.7	6.52	9.72	3.62	100.0	100.0	100.0	35.6	38.5	41.4
-2 +1 Inch	A-1	42	14.8	2.6	2.24	10.1	5.94	4.9	15.5	25.3	0.9	2.8	4.7
	A-2	53	18.7	3.3	2.36	8.96	4.77	6.5	17.4	25.6	1.1	3.1	4.8
	A-3	36	12.7	2.3	3.23	8.83	4.16	6.0	11.6	15.2	1.1	2.1	2.8
	A-4	132	46.5	8.3	10.9	10.0	2.06	74.7	48.3	27.5	13.1	8.7	5.2
	A-5	21	7.4	1.3	7.21	9.38	3.03	7.9	7.2	6.4	1.4	1.3	1.2
-2 +1 Inch	(Comb.)	284	100.0	17.8	6.78	9.63	3.48	100.0	100.0	100.0	17.5	18.0	18.7
-1 Inch				15.3	5.03	8.00	2.74				11.1	12.9	12.7
Head Calc.				100.0	6.90	9.51	3.30				100.0	100.0	100.0
COMBINED PRODUCTS													
-6 +4 Inch	C-1-2		30.3	8.9	1.49	8.93	4.97	5.3	26.9	49.0	1.9	8.2	13.3
	C-1-3		44.7	13.0	2.35	8.89	4.47	12.4	39.9	64.9	4.4	12.2	17.7
	C-4-3		80.6	23.5	10.20	10.17	2.39	97.2	82.4	67.8	34.8	25.2	18.4
	C-4-2		69.7	20.3	11.50	10.43	2.25	94.7	73.1	51.0	33.9	22.3	13.9
-4 +2 Inch	B-1-2		26.5	10.0	1.51	9.34	5.32	6.1	25.5	39.0	2.2	9.8	16.1
	B-1-3		44.4	16.8	1.70	9.18	5.10	11.6	42.0	62.5	4.1	16.2	25.9
	B-1-4		98.1	37.0	6.51	9.74	3.64	98.0	98.3	98.6	34.9	37.9	40.8
	B-5-4		55.6	20.9	10.37	10.14	2.44	88.4	58.0	37.5	31.4	22.4	15.5
	B-5-3		73.5	27.7	8.32	9.86	3.01	93.9	74.5	61.0	33.4	28.7	25.2
	B-5-2		90.7	34.2	7.03	9.75	3.42	97.8	90.9	85.6	34.8	35.0	35.4
-2 +1 Inch	A-1-2		33.5	6.0	2.31	9.46	5.29	11.4	32.9	50.9	2.0	5.9	9.5
	A-1-3		46.1	8.2	2.56	9.29	4.98	17.4	44.5	66.0	3.0	8.0	12.4
	A-1-4		92.6	16.5	6.75	9.65	3.51	92.1	92.8	93.6	16.1	16.7	17.5
	A-5-4		53.9	9.6	10.39	9.91	2.19	82.6	55.5	34.0	14.4	10.0	6.4
	A-5-3		66.5	11.8	9.03	9.71	2.57	88.6	67.1	49.1	15.5	12.1	9.2
	A-5-2		85.2	15.2	7.57	9.54	3.05	95.1	84.5	74.7	16.6	15.2	14.0

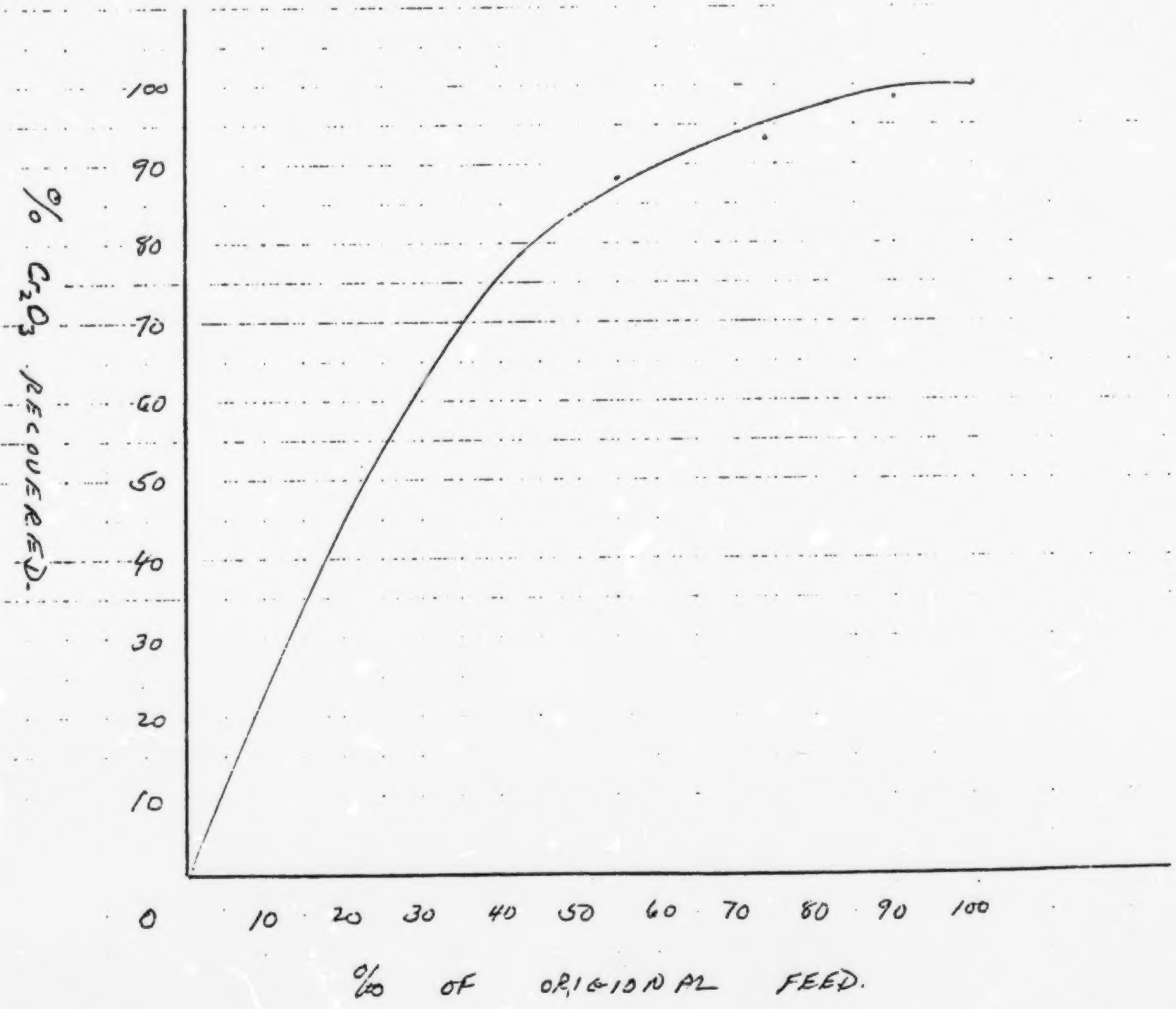
MAY 29/82

%FEED vs % RECOVERY
GRAPH FOR Cr_2O_3 +1"-2"

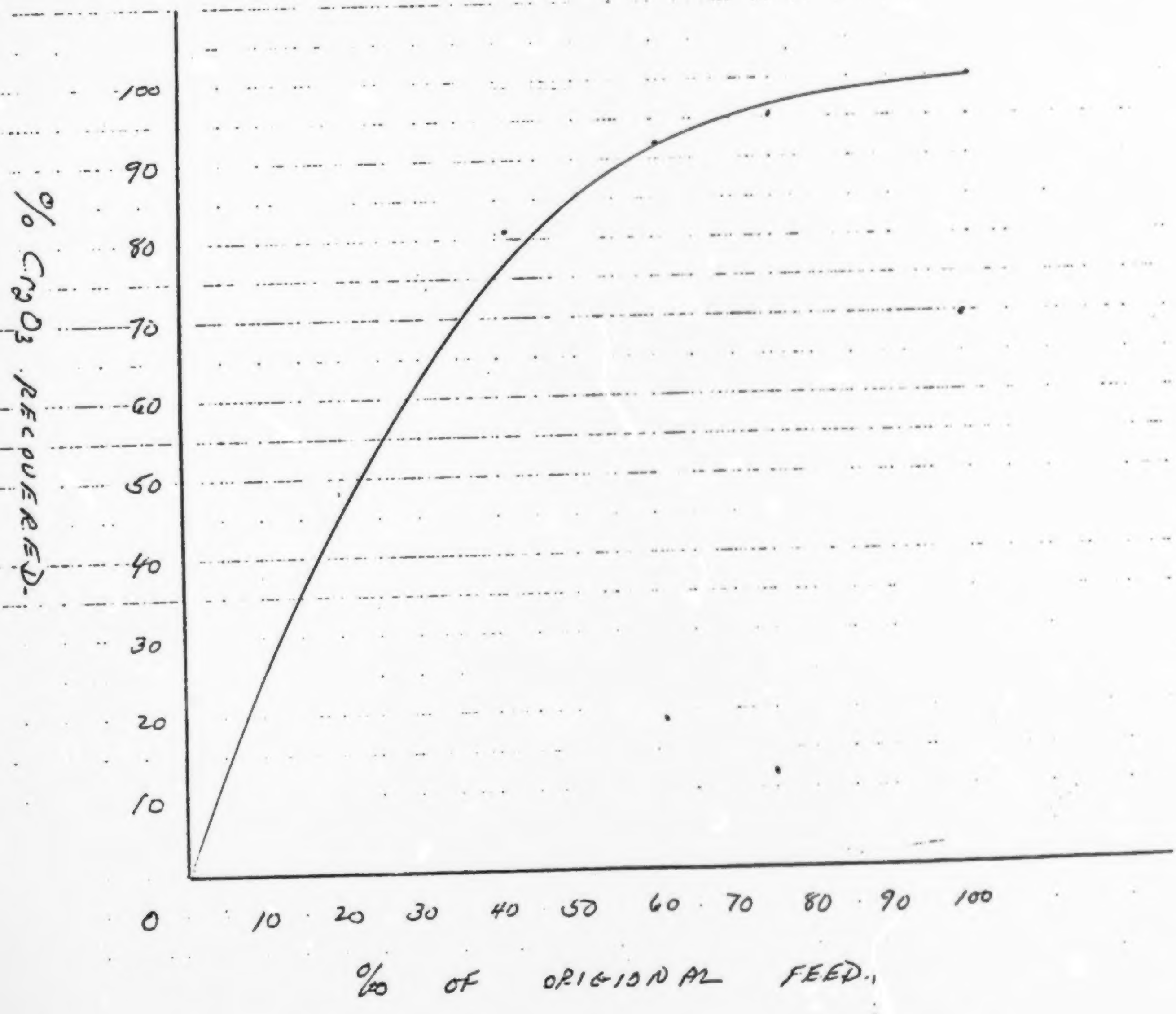


MAY 27/86

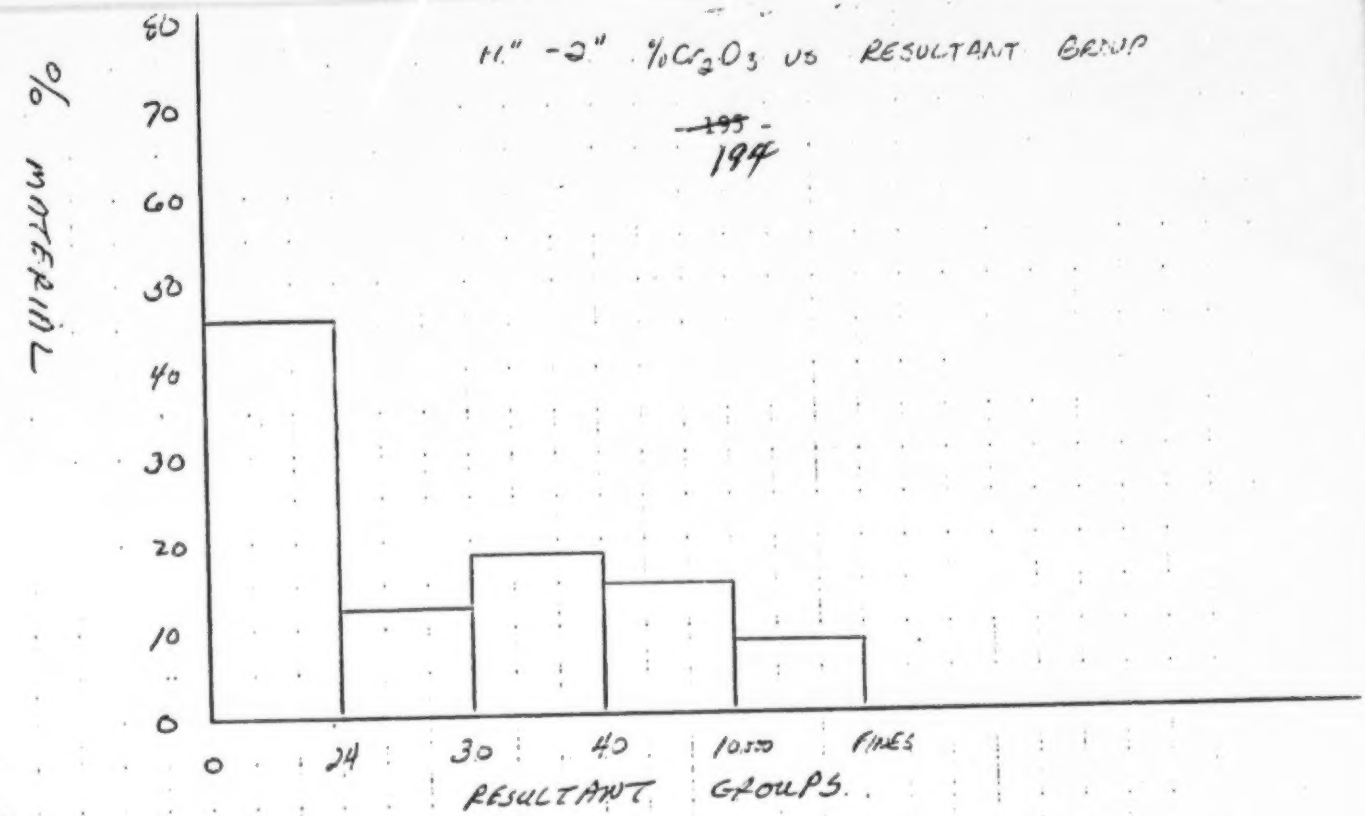
% FEED vs % RECOVERY
GRAPH FOR Cr_2O_3 +2"-4"



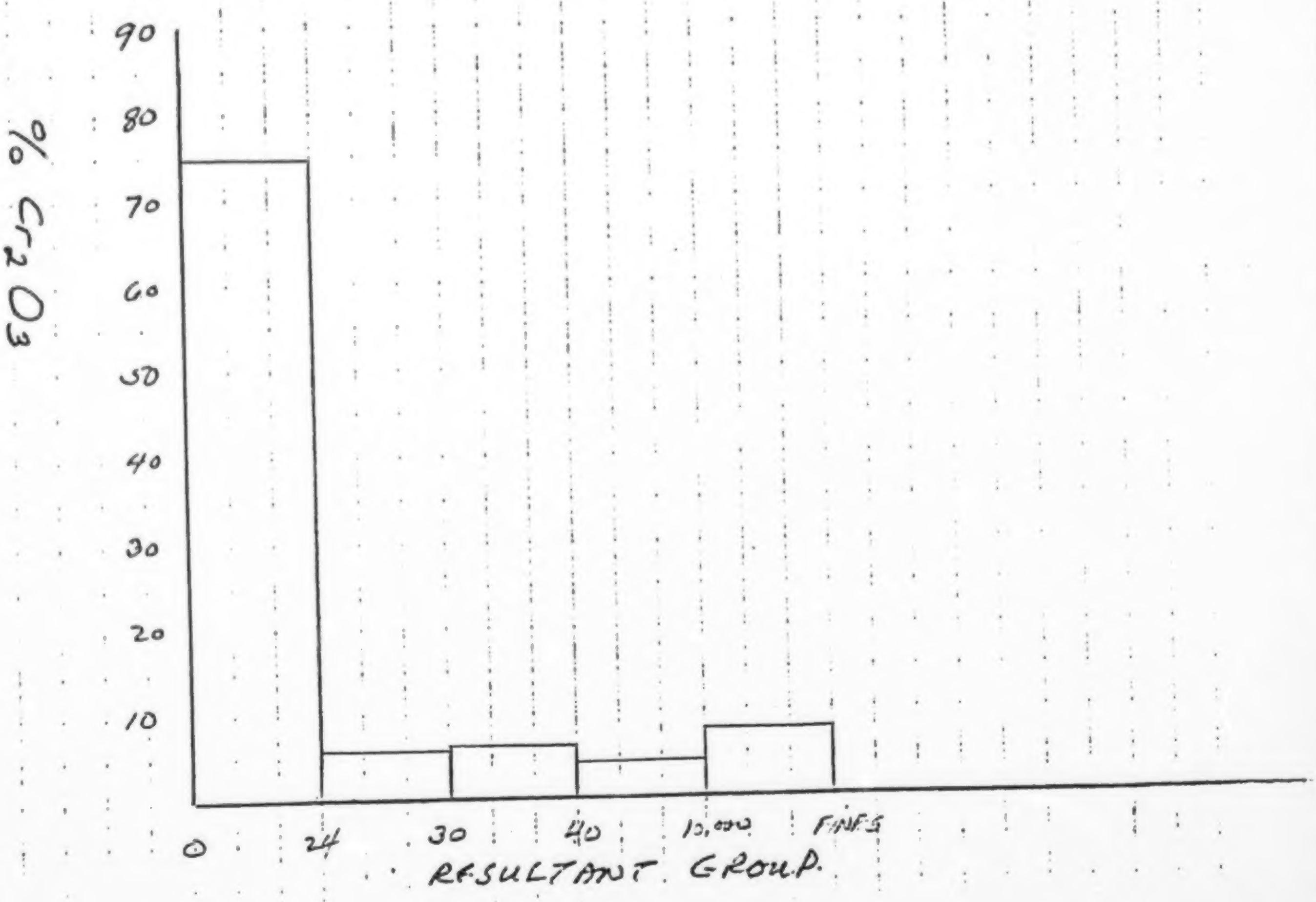
% FEED VS % RECOVERY MAY 29/80
GRAPH FOR Cr_2O_3 +4"-6"

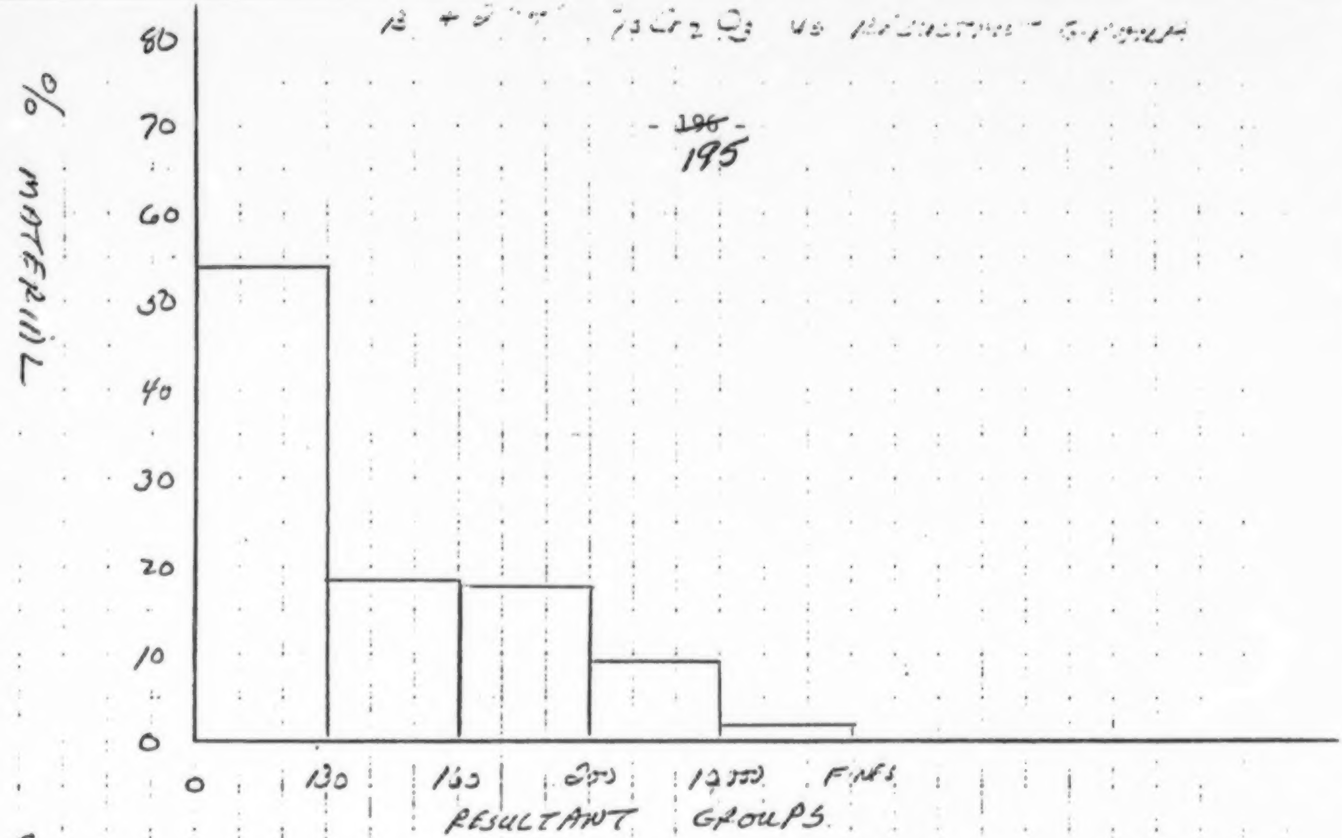


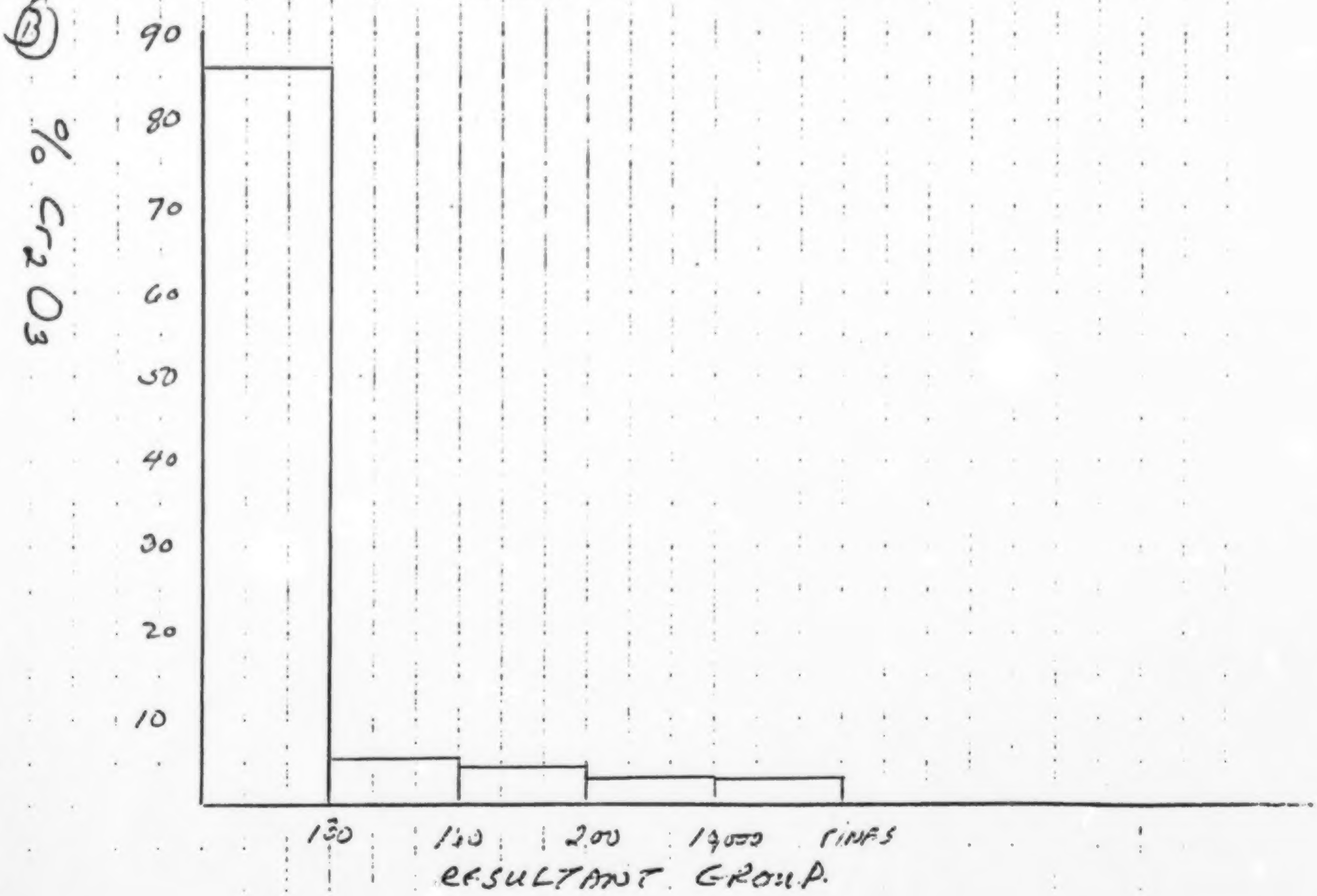
H." -2" %Cr_2O_3 VS RESULTANT GROUP



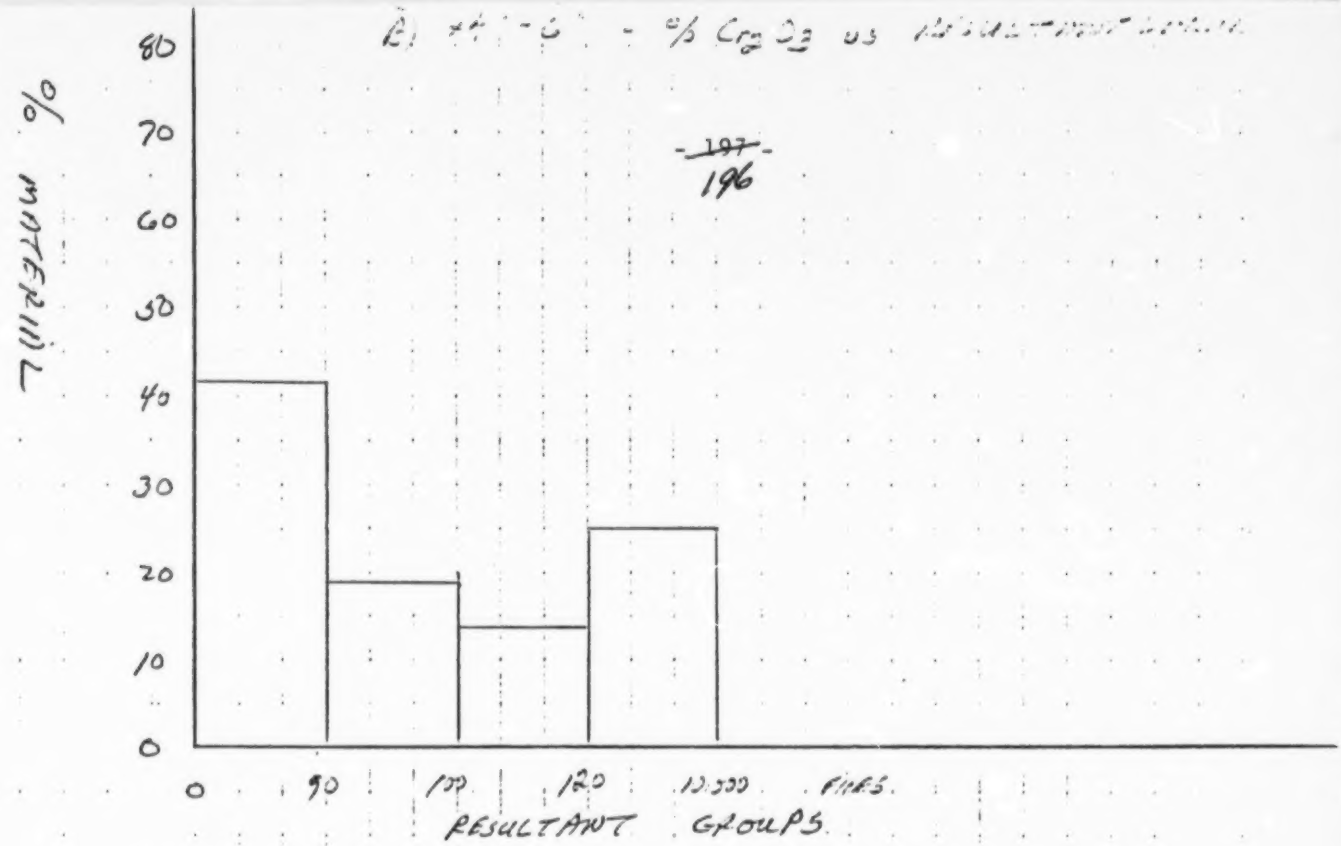
(B)

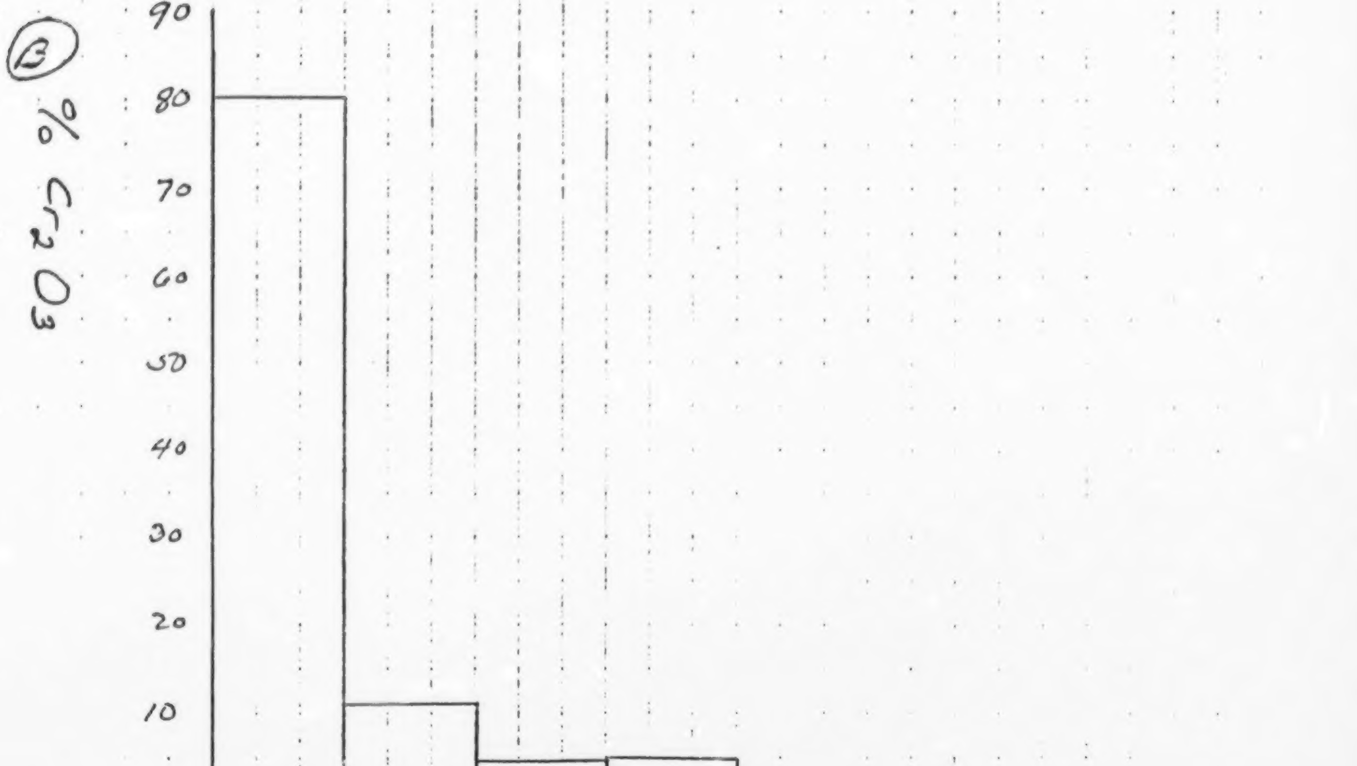


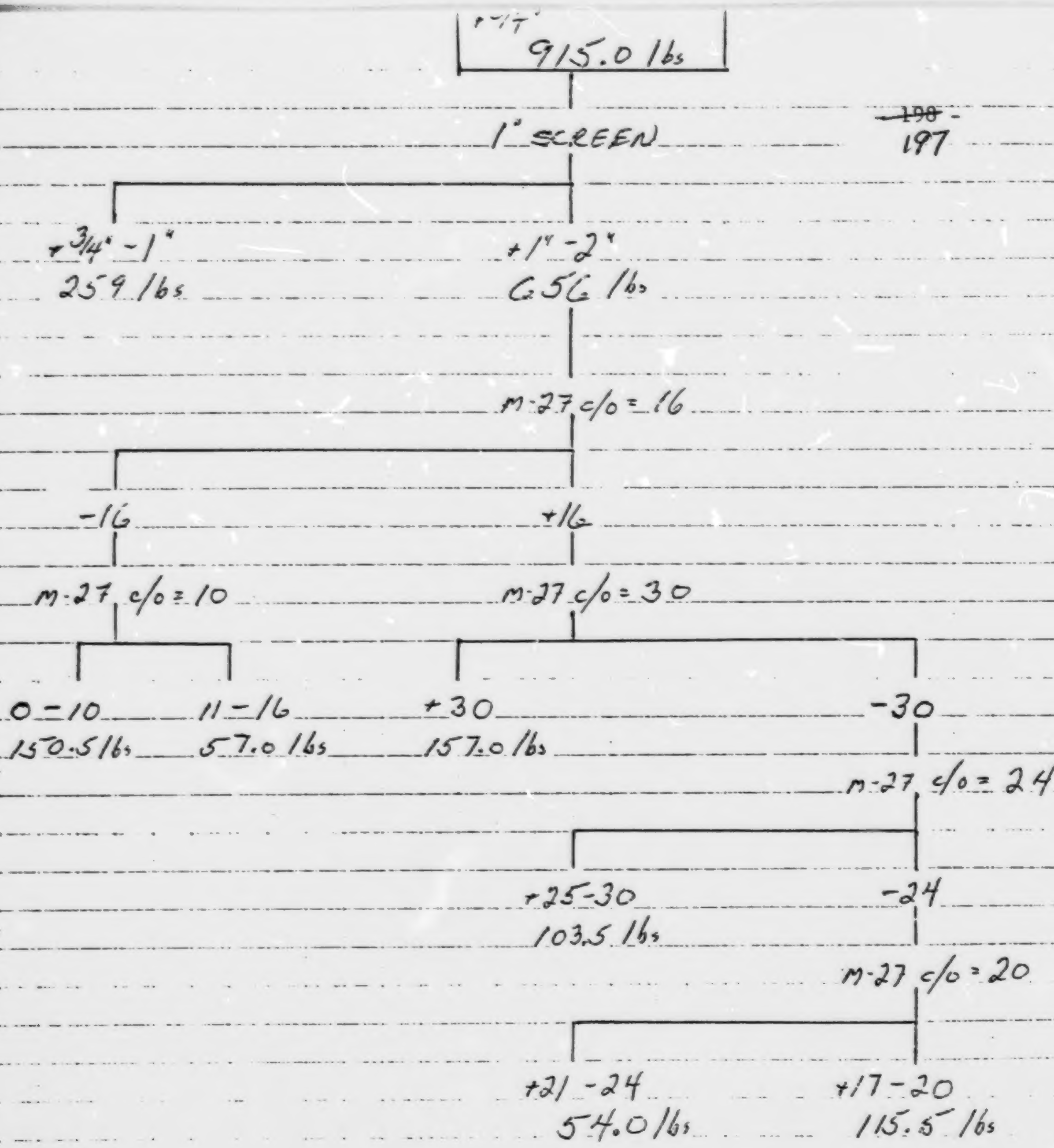

B + [illegible] % Cr_2O_3 VS RESULTANT GROUP



B) +4"-6" - % Cr_2O_3 vs RESULTANT GROUP






+¾"
915.0 lbs
1" SCREEN
+¾" -1"
259 lbs
+1" -2"
656 lbs
M-27 c/o = 16
-16
+16
M-27 c/o = 10
M-27 c/o = 30
0-10
150.5 lbs
11-16
57.0 lbs
+30
157.0 lbs
-30
M-27 c/o = 24
+25-30
103.5 lbs
-24
M-27 c/o = 20
+21-24
54.0 lbs
+17-20
115.5 lbs

NO.: O.S.C. 561 — JUNE 6/86
OBA: CHROMITE DEPOSIT
CT # 3122 LAKEFIELD RESEARCH

LE	SIZE	FRACTION	WT lbs	% WT.	Cum % WT.	ASSAY Cr_2O_3
A - 1	+1" -2"	+30	157.0	24.06	24.06	2.19
A - 2	+1" -2"	+25 - 30	103.5	15.86	39.92	2.55
A - 3	+1" -2"	+21 - 24	54.0	8.28	48.20	3.09
- 4	+1" -2"	+17 - 20	115.5	17.70	65.90	8.24
A - 5	+1" -2"	+11 - 16	57.0	8.74	74.64	7.67
- 6	+1" -2"	0 - 10	150.5	23.07	97.71	19.70
A - 7	FINES.	FINES	15.0	2.30	100.00	7.38
L			652.5	100.00		

+3/4" -1" SCREEN FINES. 259.0 UNSORTED

SAMPLE NO. : COMPOSITE
SIZE FRACTION : minus 2 inch

PRODUCT		WEIGHT lb	WEIGHT % IND.	 O'ALL	 Cr203	ASSAY % Fe	 Mag Fe	% DISTRIBUTION (Ind.) Cr203	 Fe	 Mag Fe	% DISTRIBUTION (Overall) Cr203	 Fe	 Mag Fe
-2 +1 Inch	A-1	157.0	24.6	7.9	2.19	9.45	5.29	6.7	23.5	38.8	2.3	8.0	12.5
	A-2	103.5	16.2	5.2	2.55	8.97	4.74	5.1	14.7	22.9	1.8	5.0	7.4
	A-3	54.0	8.5	2.7	3.09	8.55	4.07	3.3	7.3	10.3	1.1	2.5	3.3
	A-4	115.5	18.1	5.8	8.24	9.36	2.69	18.6	17.1	14.5	6.3	5.8	4.7
	A-5	57.0	8.9	2.9	7.67	9.39	2.7	8.5	8.5	7.2	2.9	2.9	2.3
	A-6	150.5	23.6	7.6	19.7	12.1	0.88	57.8	28.9	6.2	19.7	9.8	2.0
-2 +1 Inch	(Comb.)	637.5	100.0	32.1	8.04	9.90	3.35	100.0	100.0	100.0	34.2	33.8	32.2
A-7		15		0.8	7.38	9.59	3.27				0.7	0.8	0.7
-1 +3/4 Inch		259		13.0	6.57	9.44	3.51				11.3	13.1	13.7
-3/4 Inch		1077		54.2	7.60	9.19	3.34				54.5	53.1	54.1
Head Calc.		1989		100.0	7.55	9.38	3.34				100.0	100.0	100.0
COMBINED PRODUCTS													
-2 +1 Inch	A-1-2		40.9	13.1	2.33	9.26	5.07	11.9	38.2	61.8	4.0	12.9	19.9
	A-1-3		49.3	15.8	2.46	9.14	4.90	15.1	45.5	72.1	5.2	15.4	23.2
	A-1-4		67.5	21.6	4.01	9.20	4.31	33.7	62.7	86.6	11.5	21.2	27.9
	A-1-5		76.4	24.5	4.44	9.22	4.12	42.2	71.1	93.8	14.4	24.1	30.2
	A-6-5		32.5	10.4	16.40	11.36	1.38	66.3	37.3	13.4	22.7	12.6	4.3
	A-6-4		50.7	16.2	13.48	10.64	1.85	84.9	54.5	27.9	29.0	18.4	9.0
	A-6-3		59.1	19.0	11.99	10.34	2.17	88.1	61.8	38.2	30.1	20.9	12.3
	A-6-2		75.4	24.2	9.96	10.05	2.72	93.3	76.5	61.2	31.9	25.9	19.7

% Cr_2O_3 RECOVERED VS % OF ORIGIONAL FEED.